

The Mining Journal

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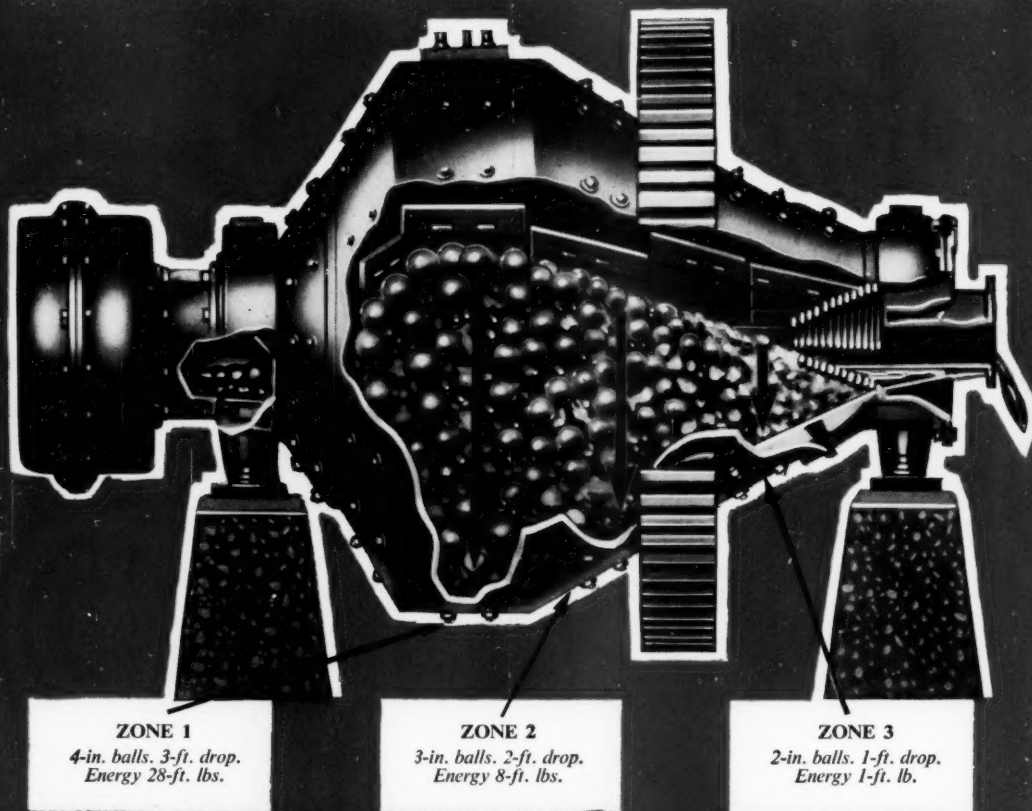
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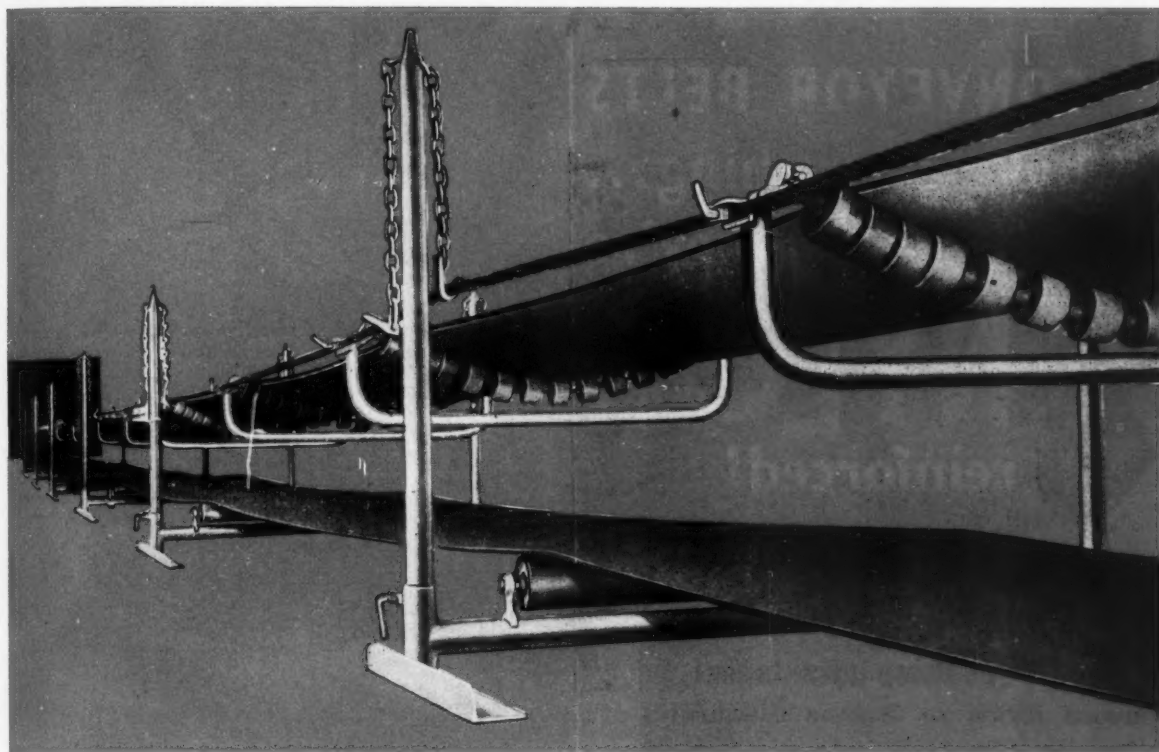
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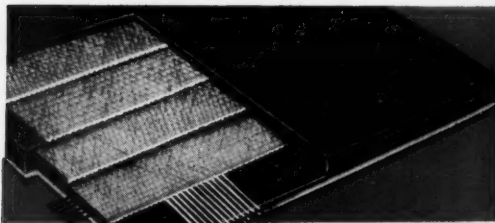
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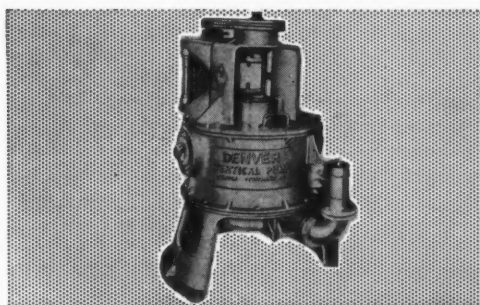
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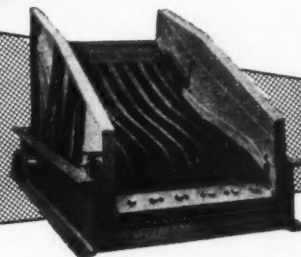
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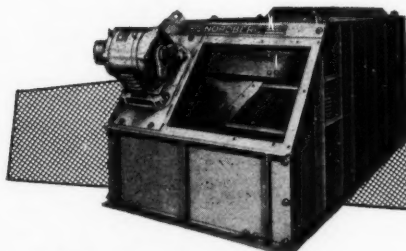
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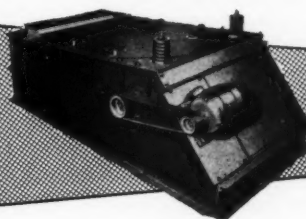
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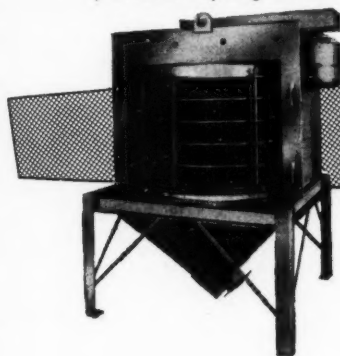
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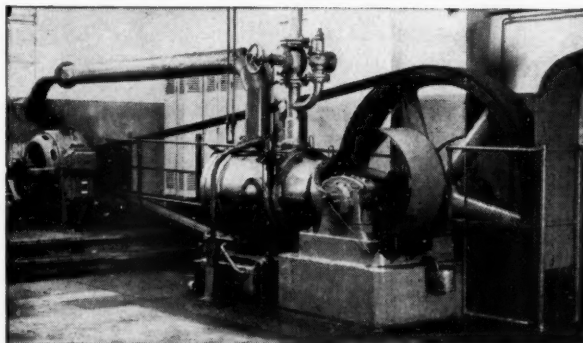
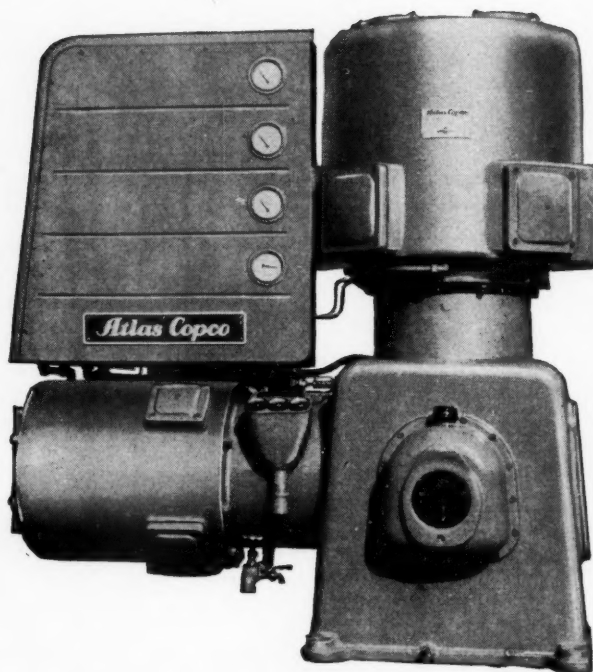
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The Mining Journal

London, August 12, 1960

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Vol. 255

No. 6521

Established 1835

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Published each Friday by

THE MINING JOURNAL LTD.

Directors

E. Baliol Scott

(Chairman)

G. A. Baliol Scott

U. Baliol Scott

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R. A. Ellefsen

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Katanga's Struggle for Independence

DESPITE the unsettled conditions in the Belgian Congo and the political chaos which now prevails, the mining industry appears to have made a remarkably quick recovery from the tragic events which followed the revolt of the Force Publique. A few days ago it was authoritatively reported that copper and cobalt output at Union Minière's properties was again at the "normal pace". The report added that the total of European employees was rising very rapidly towards normal strength, while African employees had remained at work continuously.

The resumption of "mining as usual" was by no means confined to Katanga, for reports of continued activity and undamaged plant have also been received from Symétain, which operates tin mines in East Congo and Ruanda-Urundi, and from various companies in other areas.

Now the Katanga mines are once more faced with the possibility of disruption as the result of a new crisis in which the authority and prestige of the United Nations are at stake. On the one hand the central Congolese Government, supported by Russia, Ghana and Guinea, has been demanding the forceful entry of United Nations forces into Katanga where order has already been effectively re-established. M. Lumumba and President Nkrumah have issued a joint statement threatening that the African States would set up a joint command to expel the Belgians from the Congo if no results are forthcoming from the United Nations.

On the other hand, it is contended by M. Tshombe's supporters, particularly Europeans, that abrupt replacement of Belgian troops by United Nations forces would lead to the flight of most of the 12,000 or so Belgian civilians still in the Katanga. That this could well happen is indicated by the letter which Union Minière received a few days ago from its European Employees' Association, stating that if United Nations troops came into Katanga all the employees would leave because they would not feel secure under the protection solely of the United Nations. This would effectively end the company's activities for the time being and would lead to the dismissal of 20,000 African employees, besides affecting another 100,000 Africans who are to some extent dependent on the firm. The effects of a prolonged stoppage of the Congo mines on the metal markets were considered in our issue of July 22, page 103, and the copper situation is again discussed in the current issue on page 185.

Politically, M. Tshombe's hold on Katanga appears to be reasonably strong, particularly in the south, and such measures as mobilization of the population and the obstruction of airport runways suggest that the bold front he has been putting up was by no means a bluff. Whatever Katanga's capacity for effective resistance, the mere possibility of an armed clash with the United Nations forces was sufficiently alarming to cause Mr. Hammarskjöld to postpone the dispatch of troops into the territory and report back to the Security Council for fresh instructions.

To the extent that the intervention of the United Nations in Katanga has been delayed, the first round might be said to have gone to M. Tshombe. It is obvious, however, that the authority of the United Nations cannot be flouted by any nation, no matter how small, without jeopardizing the whole machinery for the peaceful settlement of international disputes. Hence there could have been little doubt that the Security Council, however acrimonious its meeting, would authorize Mr. Hammarskjöld to take all necessary action to secure the immediate and unconditional withdrawal of Belgian forces from the Congo, including the secessionist Katanga province.

One reason for the crisis was M. Tshombe's apparent failure to appreciate that the object of the United Nations in sending troops to Katanga was not to uphold the authority of the Central Congolese Government, but simply to maintain law and order, without prejudice to the settlement of internal political issues. The foremost requirement, therefore, is that his confidence in the integrity of the United Nations should be restored.

Mr. Hammarskjöld accordingly proposed that the Security Council should give the Katanga provincial government an assurance that the presence of an international force would not prejudice its struggle for autonomy. M. Tshombe has now agreed not to oppose the entry of U.N. troops, subject to various conditions which include a renewal of the pledge of no interference and an assurance that the U.N. contingents would exclude troops from countries with Communist sympathies, among which he includes Guinea and Ghana. Most of M. Tshombe's conditions are largely face-saving, and the fact that he is now willing to negotiate offers hope of a peaceful solution.

Meanwhile, M. Tshombe has asked for Katanga's case for independence to be brought before the Security Council and has appealed to the world to recognize that "The right of self-determination is sacred". He has also called on Africa to side with Katanga against Premier Lumumba to stem Communist infiltration.

The Tshombe administration has also made it clear that Katanga has no intention of allowing the Lumumba Government to become a major shareholder in Union Minière. This was stated very bluntly by the Finance Minister, M. Jean Kibwe, leader of a mission to explain Katanga's position and its desire for independence to the world. The mission's itinerary includes Brussels, Washington, New York, London and Bonn. A separate mission has been sent to Paris. M. Kibwe said that the liquidation of the Comité Speciale du Katanga had not yet been completed and he was negotiating with the interests concerned regarding the beneficial ownership of the Union Minière shareholdings. His contention is that, though the C.S.K. was originally created by the independent state of the Congo, of which the Central Government is the legal successor, the provincial structure did not then exist and the committee's responsibilities were entirely connected with the Katanga. M. Kibwe has expressed the opinion that the Leopoldville Government would not press for transfer of the shares representing the 22.5 per cent holding in Union Minière, which it was to be allocated when the C.S.K. was wound up. It will be interesting to see whether Katanga, assuming that it succeeds in breaking away from the Central Government, can substantiate its claim to be the rightful heir to the Union Minière shares.

So far as the immediate situation is concerned, the prime aims of Western policy must be to prevent the Congo becoming a new area of the cold war and to find a means of solving the constitutional issue without injustice to Katanga, while recognizing that, deprived of its chief source of revenue, the Congo would have little hope of survival as a national entity.

The solution would appear to lie in some form of fairly loose federation between Katanga and the rest of the Congo, on the lines of the Central African Federation. Such an arrangement, which would appear to be favoured by the British Government, would enable the wealth of Katanga to be shared throughout the Congo, while the source of this wealth would remain in the hands of the Katanga administration. Russia, however, is likely to back M. Lumumba's aspirations for a strongly centralized government.

In this complex of interests it is now possible for the first time to feel that time may yet prove to be on Katanga's side, for Lumumba's popularity is apparently waning and the Central Government's hold on the Congo is being undermined by further separatist movements, doubtless encouraged by M. Tshombe's initial success in standing up to the United Nations. In the Equator Province, the majority party has come out in favour of autonomy at home with confederation. M. Joseph Ngalula, chief of the Baluba tribe, has proclaimed himself head of a new break-away province which he calls "Mining State" and which embraces the government centre of Bakwanga. Finally, the Abako party, whose head M. Kasavubu is the Congo's president, wants a separate state for the Congolese living between Leopoldville and the sea.

As an astute politician M. Lumumba might well find it expedient to consolidate his own position by making concessions to the rising tide of federal aspirations, even though he still has the backing of the most powerful nationalized elements in Africa as represented by Dr. Nkrumah and president Sékou Touré of Guinea. In these circumstances M. Tshombe, if he plays his ace wisely, might yet succeed in achieving a large measure of self-government for Katanga.

For Union Minière the immediate outlook remains critical indeed, for General Gheysens, Belgian military commander in the Congo, predicts that nine out of ten of Katanga's Europeans will leave with the Belgian army. However, M. Tshombe's intransigent attitude encourages the hope that Mr. Hammarskjöld may yet succeed in averting a catastrophe of this magnitude, which would spell the complete collapse of Katanga's administration and economy.

HOLLINGER'S GOLDEN JUBILEE

Last month Hollinger Consolidated Gold Mines celebrated half a century of operation by pouring a gold bar. In the words of our contemporary, *The Northern Miner*, this marked one of the most impressive records in Canadian mining history—half a billion dollars of gold and silver fed into the veins of the Canadian economy.

Hollinger's record is also unique in many other respects. From its inception the company was pioneered, managed and owned by Canadians. Its dividend record of nearly \$150,000,000 has few parallels in mining. Of this some 80 per cent was paid to Canadians.

With Hollinger's entry into the iron ore field, the number of non-Canadian shareholders began to swell. Last year 6,310 Canadian residents held 3,692,906 shares, U.S. residents numbered 2,329 and held 713,878 shares, while 80 Britishers owned 321,920 with 191 other shareholders holding 191,296 shares.

As a mine, Hollinger has few equals. At the end of 1959, it had 128 miles of crosscuts and 243 miles of track still open. Its diamond drills had cut 1,189 miles of core. The 59,000,000 tons of ore extracted were replaced with 30,124,199 tons of backfill.

Paying some of the highest wages in industry for many years, the Hollinger management were nevertheless able to accumulate sufficient cash reserves to permit the company to launch the great iron ore developments in the wilderness of Northern Quebec and Labrador.

The gold mine itself has not only offered great stability of employment, but also supplies its 1,644 employees with low cost housing in over 350 company owned family units renting for as little as \$20-\$25 a month.

While the mine cannot count on another fifty years of life, it will remain a pillar of the Porcupine camp for a few years yet. In the meantime its offspring in Quebec-Labrador is growing healthily and in the years to come will provide the bulk of the company's income.

AUSTRALIA'S GEMSTONE INDUSTRY

Apart from gem opal, Australian production of gemstones has been very small. Diamond and emerald deposits were worked for a time in a few places in New South Wales and Western Australia. The discovery and production of gemstones, other than those mentioned, has been incidental to alluvial mining for other minerals, such as gold and tin.

Australia is a leading world producer of gem opal. The total value of production to the end of 1957 is recorded at £3,016,341, of which New South Wales produced 54.8 per cent, South Australia 38.4 per cent and Queensland 6.8 per cent. Of the total output from New South Wales 70.8 per cent (mainly white precious opal) was from the White Cliffs field where commercial production started in 1890, and 28.9 per cent (mainly black opal) from Lightning Ridge field.

At present over 96 per cent of gem opal produced in Australia comes from Coober Pedy and Andamooka, South Australia; the remainder is from Lightning Ridge, New South Wales and near Quilpie, Queensland.

Output has risen considerably in recent years, the estimated value of rough opal production in 1957 being £184,949, which compares with £124,626 in 1956, £73,550 in 1955 and £42,590 in 1949.

The present demand for good quality opal is said to be keen, the recent marked revival in the market being attributed to some extent to increasing American and Japanese interest in gem opals and to the discovery of good stones in a hitherto unprospected portion of the principal opal field in South Australia. Buyers claim, however, that very little is offering and that the bulk of the material they purchase is of inferior quality.

There has been no advance in mining technique since the establishment of the opal mining industry in Australia seventy years ago. Prospecting for precious opal is haphazard, since there is generally little or no evidence to guide the prospector in choosing a site for operations. The usual practice is to sink shallow shafts at random adjacent to worked ground in the hope of intersecting a valuable patch, or to sink a pit or trench at random and watch for favourable indications, such as veins, streaks or patch opal (common or wood opal). Where found, these are followed laterally in the hope of obtaining the precious variety.

The total value of Australian production of sapphires to the end of 1957 is recorded as £735,199, of which over 94 per cent was from the Anakie field in Queensland and less than 6 per cent from Sapphire in New South Wales. Australian sapphires are generally deep blue to almost black in colour, although white, blue, green, yellow, purple and other shades are found. Present production is small and is entirely from the Anakie field, where occasionally some large sapphires are still obtained.

The mining of sapphires has been carried out by individuals and small parties, including a significant proportion of old-age

pensioners. The method of recovery varies according to the supply of water in the locality and to the type of wash. The basic principle is gravitational separation. When water is available the wash is cleaned and partly concentrated by sluicing, followed by sieving or screening and hand sorting. When no water is available the sapphire is recovered by dry screening and hand sorting.

Over 50,000 ct. of emeralds were won from the Emmaville deposits in New South Wales between the years 1890 and 1909; the colour of a great number of stones has been described as that of green beryl rather than true emerald.

Australian emerald is associated with coarsely crystalline rocks and hence mining methods are basically different from those used for diamond and sapphire. The rock containing the emerald is mined by shafts, drives and stopes. Favourable pieces of host rock are then broken open by hand. Such a method results in considerable loss because emerald is very brittle. Attempts to disintegrate the host rock by chemical means, and so release the emerald undamaged, have proved unsuccessful or uneconomical.

Diamonds have been found in numerous localities in New South Wales. Only at Copeton, however, has there been any relatively large scale attempt to mine them. The diamond wash was mined by tunnels and drives and then passed to a revolving screen which both cleaned and partly concentrated the wash. After final concentration in a pulsator the diamonds were gleaned by hand. Individual miners and small parties, unable to afford such equipment, relied on sluicing to clean and partly concentrate the wash, followed by hand sieving. In South Africa, in the final stage, the concentrate is passed over grease trays. This is said to have been tried on the Australian fields but with no success, the alleged reason being that the gravel was too coarse and carried away the grease. In general, about 5 per cent of Australian diamonds are suitable for gem purposes.

Small amounts of zircon (of gem quality), topaz and turquoise have been produced in Australia. Many other varieties of gemstones have been reported at numerous localities, but no production is recorded.

This information is extracted from *Mineral Resources of Australia, Summary Report No. 43, Gemstones*, issued by the Commonwealth of Australia, Department of National Development, Bureau of Mineral Resources, Geology and Geophysics (Price 5s.).

PROPOSED AFRICAN PHOSPHATES BUREAU

The preparation of an African phosphates bureau bearing the title *Comptoir Africain des Phosphates* is announced from Casablanca. As from December 31 of this year the existing *Comptoir des Phosphates de l'Afrique du Nord* will cease activities. This bureau, which at present handles the marketing of phosphates from Morocco, Tunisia and Algeria, is to go out of existence as a result of Morocco's having given notice under the agreement by which it was formed.

The projected bureau will be considerably more important than the *Comptoir des Phosphates de l'Afrique du Nord*, since as well as covering the trade of the Office Chérifien des Phosphates and Tunisian and Algerian producing companies, it will embrace the *Compagnie Sénégalaise des Phosphates de Taïba*, of Senegal, and the *Compagnie Togolaise des Mines du Bénin*, of the Togo. These last two companies are to start phosphate exploitation in their respective countries in the near future.

Should no such new bureau be formed a sharp price battle is expected to start in the overseas franc zone, where phosphates production lies well above demand. Were this to happen the Tunisian phosphate producers would suffer most due to the lower quality of their products.

Mineral Resources of the Gabon

French African States are relying on outside aid for expansion and the Gabon Republic plans to become a major steel-producing area. This review is extracted from "East African Trade and Industry"

THE 1960 budgets of the four Equatorial African states—the Gabon, Congo, Chad and Central African Republics, which formerly made up French Equatorial Africa—are all balanced, though in some cases only with French aid, to meet administrative costs, and barely cover the expenses of services already in existence. There is very little over for expansion, and each state is relying on outside aid for its development projects.

The outside aid which the territories are relying on continues to come mainly from France through the Aid and Co-operation Fund (FAC), which, since the creation of the Franco-African Community, has replaced the now defunct FIDES (French Investment Fund for Social and Economic Development).

In addition to FAC aid, the Chad also receives grants through the O.C.R.S. (Joint Organization for Saharan Regions). During 1959 assistance from France was as follows: Chad Republic: £3,500,000. Central African Republic: £3,000,000. Congo Republic: £3,000,000. Gabon Republic: £2,000,000.

The total sum was some £11,500,000, and its importance can be appreciated when it is realized that the 1959 budgets of the four states together totalled some £23,000,000.

Figures for external trade for 1959 are not yet available, but at the end of 1958 the overall trade balance of the four countries showed a deficit of £14,000,000, which was nevertheless an improvement on the previous year's deficit. Trade for the first half of 1959 showed a slight rise in the value of imports (6.7 per cent) in comparison with the corresponding period in 1958, while exports showed a more marked increase.

The Gabon Republic

The Gabon Republic, situated on the Atlantic seaboard to the north of the Congo, is endowed with a number of natural resources which are now increasingly becoming exploited. Mineral resources include manganese, oil, iron ore, and uranium, and are likely to be of vital importance to the country's economy in future years.

Manganese deposits at Franceville are estimated at a minimum of 100,000,000 tons of high-grade ore, and when exploitation is under way the country could become one of the world's largest producers. Production is due to start in 1962 with an initial output of 500,000 tons a year, and meanwhile work is going ahead on the cableway and railway line to take the ore to the coast.

Iron ore also seems destined to play a large part in the Gabon. Deposits at Mekambo have reserves of about 500,000,000 tons of high-quantity ore (over 60 per cent iron content in the Boka-Boka hills), but exploitation will mean an investment of at least £180,000,000 over eight years, and the construction of a 430-mile railway to

Libreville. Iron ore also exists at Tchibanga, which, although of a lower iron content than at Mekambo, could be enriched on the spot to 60 per cent.

Meanwhile the possibilities of an iron and steel industry are being considered, and Bethlehem Steel, which owns a large share of the capital of the Société des Mines de Mekambo, has already made a preliminary study to this end. Iron and steel projects, it is thought, might start with an enrichment plant for Mekambo iron (despite its present high content), and this could be followed by a complete electro-metallurgical industry for the manufacture of steel with the aid of natural gas from the oilfields, which are conveniently situated for this purpose.

Local crude oil and gas are already being used as a fuel to generate electricity at the new Port Gentil Power Station which was opened at the end of last year and which has an installed capacity of 4,000 kW. The plant there is steam-driven with the boilers being heated by natural gas or by oil from a well less than two miles from the power station.

The Gabon is fortunate, too, in possessing uranium deposits at Mouana, near Franceville, which contain some 20,000,000 tons of ore, or 4,000 to 5,000 tons of pure uranium, and are thus the largest yet found in the French Community. Production is expected to start in 1961, at which time the Franceville Uranium Company will have invested £3,500,000, while annual running costs are estimated at £700,000.

An ore concentration plant and a chemical factory are being built at the mines, and these, together with housing for the personnel, will be finished by the beginning of 1961. A hospital is already built. Actual uranium mining will start with opencast work, at first to the depth of 80 m. and later from 80 to 200 m. After that a start will be made on underground work.

All uranium produced by the Gabon will be bought by the French Atomic Energy Commission on a long-term contract. This is important to the Gabon at a time when there is a world over-production of uranium and world prices are likely to fall. It will be seven or eight years before the demand for uranium increases, and the Atomic Energy Commission is even prepared to cut French production during this period so that the Gabon can be assured of a regular market.

A Promising Future

The Gabon, then, has a promising economic potential. A great deal of basic development, however, is needed before this potential can be exploited to advantage. Gas and oil can be used to supply power, which is an essential condition for industrialization, and a hydro-electric plant at Kinguele is being considered. But another important factor is adequate communications. Railways are being built for the mining industry, and should play an important part in opening up both the Congo and the Gabon Republics. Meanwhile the Gabon is embarking on a road programme, and is setting up a special fund for road improvement throughout the Republic, which will come largely from extra import and export taxation. It is expected that this new taxation, which has just been approved, will bring in some 250,000,000 CFA frs. a year (\$500,000) for road repair and road construction.

Coal Handling at Lea Hall

THE Lea Hall colliery has an upcast and a downcast shaft with one winder located at each, but there is provision for two winders at each shaft head.

The winder for the upcast shaft of the colliery is of the double drum type to enable winding to be carried out from three levels. It is designed for an output of 250 t.p.h. when winding from 1,732 ft.

The winding engine at the downcast shaft is of the single drum type and is capable of an output of 300 t.p.h. from a winding depth of 1,203 ft. The drum is 16 ft. in dia. and 7 ft. wide between the flanges. The winder is designed for single layer coiling of the winding ropes, and has a spirally grooved drum shell. Most components on this winder, including the main reduction gears, are similar to those of the upcast shaft equipment. The mechanical brakes operate on the same principles, but the hydraulic circuit is simpler because of the absence of clutch equipment.

Four transport systems have been installed at the colliery, so interlinked with each other as to meet a variety of requirements.

One system transports best coal from the two shafts to the washery plant at present under construction. Another system using the same tipplers and apron feeders located in the shaft houses transports industrial coal from the mine to the crushing and blending plant. The third system involves the provision of a wagon tippler and conveyors to transport imported industrial coal to a separate crushing plant and thence to the blending bunkers with provisions to use this system to pass best coal to the washery or imported dirt to the dirt crushing plant. Finally, a fourth system deals with the transport of the R.O.M. dirt to a crusher house and disposal bunker. The designed throughputs of these systems are 600 t.p.h., 600 t.p.h., 300 t.p.h. coal or 500 t.p.h. dirt; and 600 t.p.h. respectively.

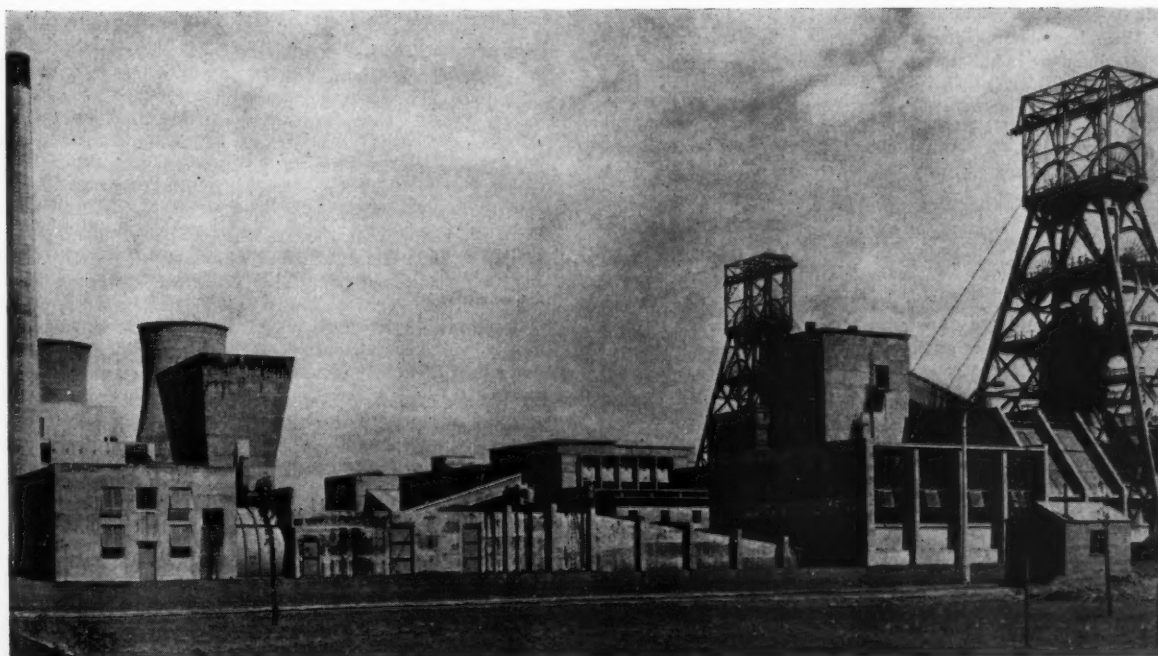
The upcast shaft house plant consists of a tippler designed to tip one 3 ton coal capacity mine car every 30 sec. feeding

The official opening ceremony of Lea Hall colliery was performed on July 19 by Mrs. E. H. Browne, wife of the chairman of the West Midlands Division of the National Coal Board. The colliery is the first to be initiated and engineered solely by the N.C.B., to exploit new coal reserves in the north eastern extension of the Cannock Chase coalfield, which up to 1949 were thought to be non-existent or of little value. The location of the colliery was in conformity with the Central Electricity Generating Board's plans to build a 600 MW power station at Rugeley on the nearby river Trent, and it was agreed to transport coal direct from the pithead to the power station. Much of the plant installed in Lea Hall colliery has been supplied by The General Electric Co. Ltd.

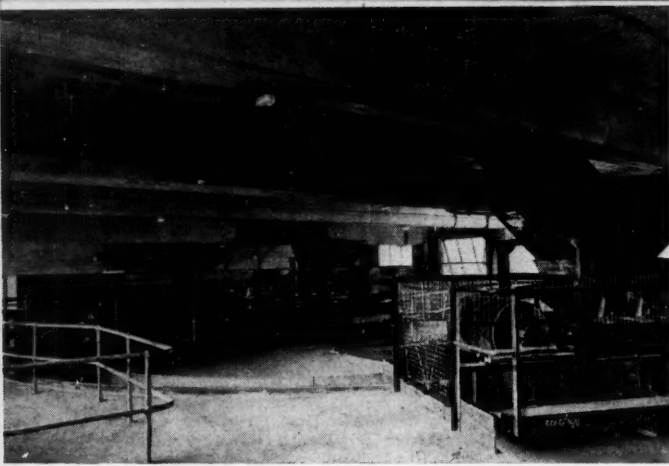
to a 48 in. wide apron feeder for coal or a similar feeder for dirt. These in turn deliver to 48 in. wide troughed conveyors. The discharge to either of the apron feeders is controlled by a flopper chute located under the tippler. Similar equipment is installed at the downcast shaft.

Best coal raised at the upcast shaft is discharged to a 48 in. wide coal conveyor and is passed to the best coal conveyor in the immediate vicinity of the downcast feeders through a bifurcation chute using a flopper device. This coal is then transported by a 600 t.p.h. 48 in. wide troughed conveyor to the washery plant at present under erection.

The coal entering this system is selected at the tipplers and in the case of that raised at the upcast shaft is transported by the same 48 in. wide conveyor as far as the bifurcation chute at the downcast shaft house where it is passed to the industrial coal conveyor. This conveyor is also 48 in. wide, of 600 t.p.h. capacity, and delivers to a single deck Gyrex scalping screen which extracts the —6 in. coal, the +6 in. passing over a 60 in. wide picking belt for removal of dirt and thence through a Pegson 25B gyratory crusher. The —6 in. coal then passes over two 72 in. x 192 in. Gyrex screens in tandem to screen out the —1½ in., and the oversize passes through a 104 in. x 42 in. Pennsylvania hammermill secondary crusher.



Pyrometallurgical Research



The two radial conveyors feed on to the blending bunker at Lea Hall

The crushed coal is then transported to the blending bunkers by a 42 in. wide belt conveyor, and a radial conveyor fitted over the bunkers provides facilities for feeding to three 150 ton capacity compartments. The crushing system is capable of dealing with large coal of 24 in. cube and coals having a wide range of hardness.

The import coal system has the widest flexibility of application. It can deal with 300 t.p.h. of imported coal for crushing, or it can transport an equal capacity of best coal to the washery, or it can pass 500 t.p.h. of imported dirt to the dirt crushing system. Rail borne coal is discharged into a bunker by means of a Fraser and Chalmers side discharge tippler and is removed by a 5 ft. x 10 ft. Sherwen electromagnetic vibrating feeder and fed to a 36 in. wide conveyor.

This conveyor delivers to a 300 t.p.h. Gyrex screen and the process, through a separate crushing system, is similar to that which is utilized for the industrial coal system. Since the capacity of this system is only 50 per cent of that of the industrial coal system, the capacities of the screens and secondary crusher are somewhat smaller also. Witton Kramer 65 in. dia. suspended magnetic separators are provided on both coal crushing systems. They are located immediately in front of the primary and secondary crushers at the points where coal density is at its minimum.

The coal blending plant consists of six 150-ton capacity bunkers fed by radial conveyors which permit wide flexibility of use. The normal allocation is three bunkers to the Lea Hall product, one to imported and two to the $\frac{1}{2}$ in. best coal which is screened out at the washery and transported to the blending bunkers.

Blending will be effected by 9 ft. dia. feed tables located at the discharges of the bunkers. These will feed a 36 in. wide conveyor with a 100 per cent standby to the reception hopper of the Rugeley power station of the C.E.G.B. The two belts are fitted with weighers and samplers with a sampling house located immediately adjacent to the reception hopper.

In addition to the three coal handling systems, a dirt handling plant has been installed. When dirt is sent up either shaft, it is discharged by a rotary car tippler on to a 48 in. wide apron feeder and from there on to a 48 in. conveyor linking the two shafts. It is then passed through a Ross two roll grizzly screen set at $\frac{1}{2}$ in. The undersize is conveyed to a crushed dirt bunker, but the oversize is led via a 60 in. picking belt to a 42 in. by 30 in. Blake jaw crusher reducing the product to $\frac{1}{2}$ in. before it enters the crushed dirt bunker.

At present the dirt is removed from this bunker for direct disposal, but G.E.C. has also received an order for an extension to this plant, which, when operating, will further crush the stone and deliver it back to the shaft head for stowage underground.

A UNIVAC 60 computer is used at the U.S. Bureau of Mines Electronic Computer Service. Information is put into this machine on punched cards, and answers are punched by it into cards. The standard Remington Rand 90-column accounting punched card is used, and the necessary auxiliary equipment for handling punched cards has been provided.

Tabulations of Thermodynamic Properties

One of the earlier problems posed by the Pyrometallurgy Laboratory was that of calculating the heat content of pure iron at intervals of 5°F. over the range of 0°-3,000°F., taking account of the phase changes and change of state that occurred.

Although each calculation concerned was simple, the problem nonetheless was to undertake 601 sets of calculations involving transformations of integral values of Fahrenheit temperature to fractional values of Kelvin temperature, selecting the proper equation for the temperature, calculating the answer, and finally expressing it in B.T.U. per lb. instead of calories per mole. It was decided that this problem was suitable for computer solution.

The programme for this problem was unusual since no data were fed to the computer. The computer calculated the heat content of iron at 0°F. and punched out this temperature value and the results into a blank card. It then was instructed to increase by 5°F. the value of temperature that had been stored from the first card and to proceed with the heat content calculation corresponding to that new temperature level. By continuing in this manner the computer created its own data internally and stopped computing only when the value of temperature in its memory reached 3,005°F. This technique of internal data creation eliminated completely the cost of preparing any cards for the computer.

Time required to programme and compute the deck was:

Metallurgical technologist	1 day
Computer specialist	2 hr.

Computer time:

To check test case	$\frac{1}{2}$ hr.
To compute 601 values	12 min.

Overall, the time saving was 80 per cent; the table was prepared in 1 day, instead of 6 days at a desk calculator; and the cost saving was 55 per cent when compared to the cost for a clerk operating a calculator. Most important, an error-free tabulation was obtained in two useful forms: A legibly printed tape for desk reference, and a deck of cards that could be used as a source of heat content data for subsequent work.

Starting with a deck of blank cards and a cleared machine, the first card was calculated for 0°F. from a machine-fed value of zero. Next, 5°F. was added to the temperature and the result was placed in storage register for use with the next card. Use of branching to select the proper equation of state by reference to established temperature limits occurred subsequently and further calculations rounded off the answer in the final decimal place.

After this step four storage units were subsequently set for punching the answers desired. The machine was routed to the signal that set the punching dies, then to establish a temperature 5°F. higher for the next card, and finally to Trip, the operation that discharged the card from the machine. The next card was fed automatically and the cycle started anew. The arrangements for halting the cal-

Research by Electronic Digital Computer

A small electronic digital computer employing punched cards has been used to facilitate the solution of a variety of problems in U.S. Bureau of Mines pyrometallurgical research. In this work the computer has been found to be economical for solving both simple problems that occur repeatedly and those involving complex or iterative calculations. The work reported in this article was conducted during research on pyrometallurgical processes undertaken by the Pyrometallurgy Laboratory, Bruceton, Pa. Facilities included a blast furnace, open-hearth and electric-arc furnaces, a converter, a rotary kiln, and other experimental furnaces. The scope of research varies from the development of new processes to the evaluation of raw materials for existing processes. The types of calculations required range from those involving attempts to determine complex mathematical relationships between physical quantities to those concerned with simple summaries and analyses of daily furnace production. The whole is reported in U.S. Bureau of Mines' Information Circular 7959

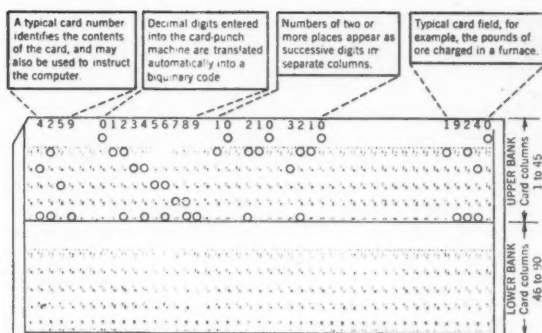
culations after the 3,000°F. data were punched occurred later. The machine was not stopped until the second cycle after this temperature to allow time for the last card calculated to be punched and fed into the receiving hopper. By using a sorting instruction, these last two cards were segregated.

Periodic Analyses of Experimental Operations

A major project of the Pyrometallurgical Laboratory is concerned with research upon ironmaking in a 4-foot hearth blast furnace. The project supervision was faced with a formidable problem in analysing the results of operations for both daily and non-daily periods of particular interest because so many variables had to be considered.

A system for processing these data through the computer has been developed and placed in operation at the computing centre in Pittsburgh. It included the design of new data forms suitable for fast, accurate card punching without any intermediate transcription of operational data. This computer programme handles not only a large volume of data, but a wide variety of data items and results as well. It has a capacity of 46 items of input data read by the computer from 9 different card forms and an output of 48 summary results. The calculations desired were found to be adaptable to machine computation since there was considerable similarity in the methods used to reach the various results. Among the 48 output items are 10 arithmetic averages, 10 weighted averages, 21 cumulative totals, and 7 ratios. Owing to similarities, these results were accomplished in a programme of only 60 arithmetical steps (the summary cards are passed through the computer twice).

The programme includes provisions by which the computer may compensate for missing data, such as chemical compositions of metal or slag. It "recognizes" which data items each card contains and then proceeds to select the programme tailored to the type of data in the card from one of six programmes that have been designed to encompass all of the computing patterns required. When the computer recognizes a summary card, that is, a card for answers, it selects the proper summarizing programme from four that have been prepared for computing and punching the desired results, using the information accumulated from the preceding detail cards.



A 90-column punched card

A major advantage of this type of programme is that summaries of operations may be made on any number of arbitrary intervals within a particular time span of furnace operations. A summary for such an interval can be accomplished simply by inserting summary cards.

A second advantage is that all operational decisions are made by the computer, so that a minimum of effort and time is required of the computer operator.

The entire daily summary is prepared and tabulated in less than 2 hours by one machine operator, and fully one-half of this time is consumed in punching the cards, which average about 120 per day. A summary for a period of operations embracing portions of days is prepared in less than 1 hour from the detail cards that have been punched previously for the daily summaries. Contrast this with an average of six hours' work by an experienced employee using an automatic desk calculator to make a daily summary and a like task for each period summary desired. Not only has the actual cost for a summary been reduced to one-quarter of the cost when using a desk calculator, but a skilled technician has been freed for creative work, and all of the data remain readily available for further investigation.

Complex or Iterative Calculations

Problems of this second type are those which are extremely difficult for desk calculation. Relationships are usually algebraic. At times an analytical solution seems hopelessly complex, so resort must be had to a numerical approximation which itself may be exceedingly lengthy. Typical operations of this character include the evaluation of a series to a specified convergence interval or the solution of partial differential equations or higher rank matrices. In the latter case, interest lies in determining precisely small differences between very large numbers. Machine computing is appropriate for such problems even though only a few cases may be presented for solution. In fact, such problems are characterized by relatively small groups of input data that are to be operated upon in a large number of intermediate calculations which often are repeated in cyclic fashion. The computer need only be given the instructions for one cycle, a means of looking back to its start, and criteria for deciding when the results of the desired precision have been reached.

A problem simpler by far than the foregoing was one concerned with relating the flow patterns in the channels of an experimental type of burner through the Reynolds number to a criterion of flame stability that incorporated the Reynolds number to a fractional power. Calculations of this type are always tedious, hence liable to error. In this instance an afternoon's work with the computer produced results that would have required several days of desk calculation.

Assistance for Rhodesia's Smaller Prospectors

THE question as to whether or not the mineral resources of the Colony are being exploited to the fullest extent possible consistent with prevailing economic conditions is one which has been of great interest to the Department of Mines for some considerable time. The ever-increasing demand for metals and minerals has led to the development of many new techniques, and it is apparent from these developments that the chances of finding new ore in Southern Rhodesia still remain very good.

In order that the new techniques could be usefully applied the reserving of large areas for scientific prospecting under stipulated conditions was devised and has proved satisfactory. At present, under this system there are Exclusive Prospecting Orders held or pending involving a combined area of 3,244 square miles on which the stipulated expenditure amounts to £792,000. The stipulated expenditure is the minimum, and not the actual—which experience has shown to be in many cases considerably more.

The companies carrying out such large-scale prospecting require very little assistance from government except the provision of basic geological maps and information, legal guidance on the mining law and hire of plant occasionally. They are well-equipped otherwise.

The granting of these exclusive prospecting orders has meant that large areas must be closed to ordinary prospectors.

The Smaller Deposits

Reviewing the industry as a whole in the light of current development it was felt that, while the possibilities of finding large-scale deposits had been adequately catered for, there was the problem of the finding of small and medium sized deposits and so helping to maintain that branch of the industry which has been so important to the Colony in the past. In addition, it was considered that certain of the operating mines might well warrant detailed study in an attempt to find new ore. After reviewing the position fully it was decided that any schemes adopted should be directed towards gold exploration in the first instance.

It must be realized that prospecting under modern scientific conditions normally involves considerable expenditure which would be quite outside the scope of this project. The problem facing the department is, therefore, to devise ways and means of applying these methods on a limited scale within its resources which can be applied to meet essentially the needs of the smaller operator. The work carried out so far has indicated that there are many difficulties to be overcome to achieve this.

After considerable discussion it has been decided that the basic approach will be essentially in the following procedure.

(1) An investigation of small mines at present held, which are worthy of further exploration of a speculative nature; government to provide professional advice and financial assistance. Such financial assistance will be as follows:—

- (a) Where the owner possesses funds, government to provide 50 per cent of the required amount for exploration up to the limit of the funds voted by Parliament from time to time. If this exploration is unsuccessful the amount provided by government will be written off.

In this article, reproduced from "The Chamber of Mines Journal", R. B. Anderson, chief government mining engineer, Southern Rhodesia, explains in detail the reasons for and the working of the new Exploration Section in the Southern Rhodesia Department of Mines. The Section was set up recently under the direction of Dr. Amm, the newly appointed director of Geological Survey

- (b) Where the owner does not possess the ready cash, but can provide security the whole amount to be loaned by government on the 50 per cent participation basis.

(2) Areas to be reserved against prospecting to allow geological investigations to be carried out.

- (a) If a small or large deposit of some promise is found the Mining Affairs Board can invite tenders for an Exclusive Prospecting Order on conditions ranging from full liability of the applicant to 50 per cent participation as in 1 (a).

The following is a provisional list of the activities which are already, or will be, undertaken by the Exploration Section, together with notes on the factors which will influence the areas to be investigated.

Work of the Exploration Section

A branch has been opened in Bulawayo with Dr. Goldberg in control, who will attend to all requests for geological assistance in Matabeleland. Similar officers are already stationed at Gwelo and Salisbury.

It will be an additional function of these officers to make examination of all mines in their areas, either as a routine matter or on request, with the object of suggesting likely development schemes in which government may participate on a 50 per cent participation basis.

Power loaming was carried out as part of the ex-servicemen's scheme, but was not entirely satisfactory due to the equipment in use. The present scheme has been initiated after considerable experimental work and the equipment devised will now properly penetrate rubble beds. An experimental unit has been running in the Gatooma district for three months. This is, to a certain extent an original method of prospecting for gold, which at the same time yields valuable sub-outcrop data. Consequently, as the results are sufficiently encouraging to treble the size of the unit, an organized geological investigation of selected areas is under way.

The equipment is designed to drill to a maximum depth of 3½ ft. This design has been successfully modified to drill to depths of 5 ft. As such the unit is more suitable for investigations in Matabeleland, where soil depths are comparatively shallow. Likely areas have been selected in Matabeleland, and it is hoped to have the enlarged unit running early in April.

It is intended to regard this method of geological investigation as an experiment for at least a year of full operational time. If satisfactory results are achieved then experiments will be made with heavier equipment to allow prospecting through greater depths of overburden.

A start has already been made by co-operating with a large mine on the following basis: the mine uses its geological and survey staff to do the sampling and the Department does the chemical and spectroscopic analysis. Encouraging results have already been obtained. The problem here is to employ geochemics on a small scale in identifying gold deposits.

A self-contained portable diamond drill has been constructed using non-coring tungsten-carbide tipped bits or coring diamond bits. This unit has been the subject of a technical article (R. F. Hill—"Notes on the use of Coal Drill Bits with Small Diamond Drills", "Chamber of Mines Journal", Vol. 1, No. 6, October, 1959). This drill will be used where necessary to follow-up indications revealed by the methods dealt with above.

The drill will be hired out to operators who wish to seek for extensions of reefs, etc., as well as being used within the limits of the present scheme.

The distribution of some gold reefs appears to be controlled by structures in the wall rocks which may be mappable. This form of mapping will, therefore, be used to follow up any indications found by the methods discussed.

The government can only benefit indirectly from any

finds which may result from the Exploration Section's activities, and must accordingly keep its expenditure within economic limits. The essential function of the Exploration Section is to acquaint companies and individuals with any promising methods of prospecting and encourage use.

As has been stated, the present intention is to concentrate on gold deposits. Should the work of the branch prove successful, however, it is proposed as time and opportunity permit to carry out investigations of certain known deposits of minerals which are either:—

- (a) not being worked but appear to merit further investigation;
- (b) insufficiently known;
- (c) contain either metals or non-metals not currently saleable but which may be of value later.

Many of these bulletins are now out of date and out of print. It is considered that a future function of the Exploration Section will be to republish such bulletins with the maps and economic sections brought up to date.

It will be appreciated that the functions of the Exploration Section as outlined above constitute an extremely ambitious programme. It must, therefore, be regarded as a long-term experiment to be reviewed periodically.

Rotary Drilling in Shaft Sinking

ECONOMICAL and safe shaft sinking, utilizing the rotary clay seal method, is reported by Reynolds Mining Co., United States, and has been the subject of an informative article in *Mining World*. The author is Martin Honke, Reynolds' senior mining engineer.

In shaft sinking to reach deep, bauxite deposits near the town of Bauxite, Arkansas, Reynolds sited three circular shafts each with a minimum inside dia. of 72 in. The shafts were drilled to depths approximating 500 ft. The two main ore-hoisting shafts (509.5 ft. and 525 ft.) were 16.25 ft. apart, measured from the centres; the other shaft was an auxiliary (513 ft.). The proximity of the ore shafts one to the other allowed for balanced hoisting with a single headframe and hoist.

The sinkings were through unconsolidated water-bearing sediments. Indeed, because of the loose nature of the ground a single, large dia. shaft could have promoted various difficulties, and it was for this reason that the described pattern of sinking and size of shaft orifice was adopted at Bauxite.

So far as safety of operation is concerned, the rotary method employed proved more efficient than others considered, in that when rotary is used no worker enters the shaft itself until work is completed. In actual drilling, a rotary Lee C. Moore derrick of the oil field variety was used for sinking. Capacity was 437,000 lb. The rig was 87 ft. high with 5½ ft. crown and 24 ft. base. The National draw works used butane fuel. Full hole drill rods (API, 6½ in.) with Layne swivel and an American Well and Prospecting Co. table were used.

In sequence, a surface seal was hand-dug beneath the derrick. The seal took 10 ft.-20 ft. of 120 in. inside dia. corrugated liner, and the annular space outside the liner was grouted. Sumps for mud and make up water and a flume were dug. A 6 in. Kansas City Hay Press pump capable of delivering 1,000-2,000 g.p.m. was used in mud circulation, the mud being controlled at 9-10 lb. per gal. with a viscosity of 30-35 sec. and a pH of 8.

Bit rotation in large hole drilling was 20-40 r.p.m. A 20-in. dia. pilot hole was drilled slightly deeper than probable shaft depth, the excess being for storage of some of the

drill cuttings so that the pilot hole would not become choked. The pilot holes were drilled slowly to ensure straightness in the plumb. A 4,000 lb. collar prevented oscillation.

At 80 ft. the bottom seal area was cased to an inside dia. of 82 in. and a wall thickness of ¾ in., thus preventing ground water circulation in the shaft. The casing was centred in the 94 in. hole and was grouted into place. Drilling was then resumed to the desired depth using an 82 in. dia. bit, with guides placed to prevent whipping, and swivel pressure maintained at 20-25 lb. p.s.i. A 30,000 lb. drill collar was used.

The 72 in. inside dia. shaft casing had a wall thickness of ¾ in. A head with 6 in. centre pipe was welded to the first section of shaft casing, and 6 in. pipe extended to the section top. The casing was centred in the drilled hole. By filling the casing with controlled mud at 9-10 lb. per gal. lowering was accomplished in the hole, additional sections being welded to the top as depth increased. At the bottom of the 82 in. hole a head was welded to the casing top, 6 in. pipe was extended through, as were two 4 in. pipes to allow maintenance of circulation during pressure and grouting operations. Circulation around the casing was commenced by pumping down the 6 in. centre line and allowing the return to surface around the 72 in. casing.

A 14 lb. per gal. cement grout was pumped down the 6 in. centre line, displacing the mud, and when the void around the lower 100 ft. of casing was filled by grout, a packer was forced by water to the bottom of the 6 in. liner and held there by pressure. Grouting was then continued through one of two 2 in. lines lowered from surface in the annular ring. All grouting was done beneath the rising surface of the grout, and grouting continued until it overflowed at surface.

Some 2,000-3,000 sacks of cement were used in grouting the casing in each shaft, with 50-100 lb. p.s.i. hydrostatic pressure being maintained inside the casing during grouting operations to prevent internal collapse of the casing.

After the cement had properly aged, the pressure inside the casing was released and the orifice was ready for equipment as a mine shaft.

Machinery and Equipment

A Smaller Double Drum Drive

Until recently, the Mavor and Coulson range of double drum drives for belt conveyors in mine roadways consisted of three sizes, Nos. 3T, 4T and 5T. It now consists of five sizes, for a smaller unit, No. 2T, and a very big one, No. 6T, have recently been added.

The No. 2T is made for belt widths from 24 to 42 in. Like the larger drives, it has two driving drums round both of which the belt passes. On each side is a cheek, a strongly-ribbed casting. The two cheeks are joined by heavy cross stays so as to form a rigid structure preserving the alignment of the moving parts. This structure needs no baseplate or foundations but can stand directly on any floor or made-up ground, provided that the ground can support a bearing load of 1 ton p.s.f., i.e., 15½ p.s.i.

The motor is in one of two sizes: either 40 to 50 h.p. or 55 to 70 h.p., either flange or foot mounted. Next to the motor, a fluid coupling can be included. Next again, there is generally a brake for bringing the conveyor to rest when the motor is switched off, without letting it go on running—and go on delivering coal—for too long, and for holding a loaded belt on a gradient.

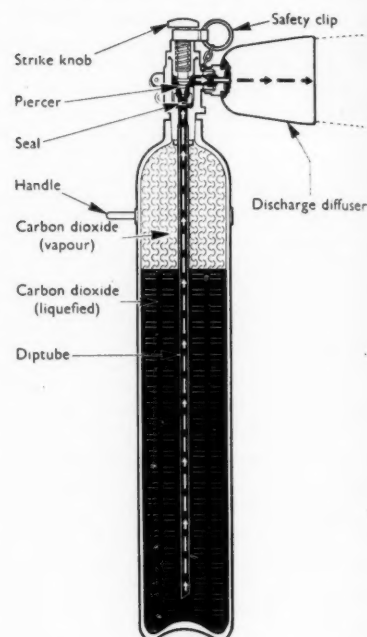
The first speed reduction is by double helical gearing, the second by straight-cut gearing with a large spur wheel on the shaft of each of the two driving drums. The driving drums consist of an accurately turned shell spigoted to cross-shaped plates which are welded to the shaft. The diameter of the drums is 25 in.

The drive will often be used in gate-roads where access can only be had conveniently to the side that is in the middle of the roadway, the other side of the drive being close to the side of the roadway. The 2T can always be placed so that the brake and all the gearing and gearcases are on the accessible side, for when necessary the drive can be turned end for end and its hand changed.

The bearings of the driving drums are carried in eccentric housings. To change the hand, the housings are reversed, raising one drum and lowering the other. The width of the drive is small, for on the gearcase side the greatest width is 1 ft. 10 in. beyond the belt, and on the other side as little as 11½ in. These dimensions include a brake; but if a fluid coupling is also included, the motor projects about 2 in. beyond the 11½ in. dimension for a 42-in. belt, or correspondingly more for a narrower belt. The weight of the drive is about 3½ tons.

CARBON DIOXIDE EXTINGUISHER

The introduction of a leak-proof, strike-knob, 5 lb. carbon dioxide fire extinguisher, Model 1505, the result of several years' experiment, is announced by Nu-Swift Ltd. The new model is complementary to the 10 lb. carbon dioxide extinguisher, Model 1510, first marketed in 1958.



Diagrammatic drawing of the new 5 lb. carbon dioxide extinguisher

Mainly intended for fighting inflammable liquid fires, and fires involving electrical equipment indoors, the new extinguisher has a mean range in still air of 11 ft., the carbon dioxide being expelled, for 8 sec. at 65 deg. F., through a novel type of discharge diffuser.

Designed for fire fighting at close quarters, the new model, in the hands of an inexperienced fire fighter, is capable of putting out a 6 sq. ft. inflammable liquid fire. In the case of an experienced fire fighter, the corresponding figure is 9 sq. ft.

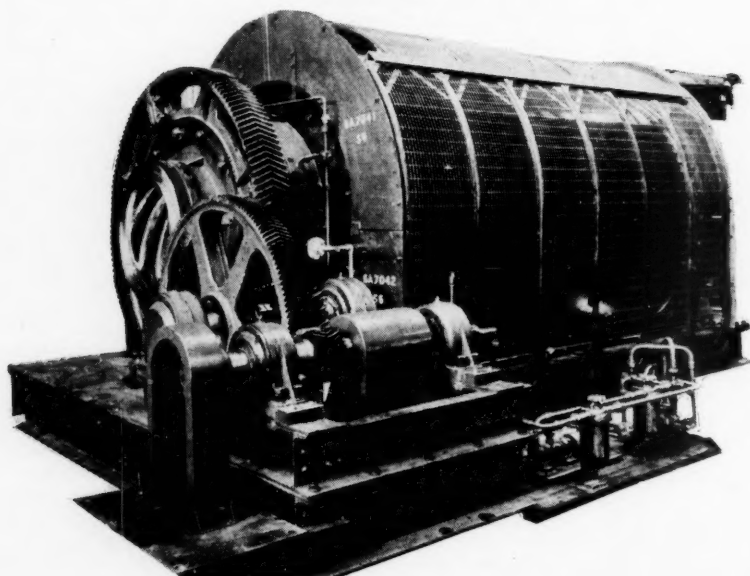
DIESEL-ELECTRIC TRUCK IN U.S. QUARRY

A new 55-ton payload diesel-electric truck has been demonstrated at a stone quarry in the U.S. Designed for open pit mining and for large scale construction operations, the rear dump ore hauler, called the Lectra Haul, showed manoeuvrability and versatility in turning, climbing, starting, stopping, and dumping. Manufactured by Unit Rig and Equipment Co., the truck is 41 ft. 8 in. long, 14 ft. wide, and 14 ft. 4 in. high. Wheelbase is 21 ft. 5 in. It has been described in *Mining Congress Journal*.

The off-highway vehicle incorporates General Electric's motorized wheel drive, aspects of which were discussed in our issue of July 22, 1960.

Electric power for the motorized wheels is supplied from a generator driven by a 600-h.p. Cummins VT-12 diesel engine. Each wheel has its own integral electric motor and simple gear drive arrangement. The entire motor is mounted within the rim, which in turn is bolted to the side of the vehicle. The four series-wound traction motors are continuously cooled by external blowers.

Weldmesh is incorporated as guarding in several machines manufactured by Sheepbridge Equipment Ltd., and in particular in the Sheepbridge ball and rod mills as shown. These machines handle the fine grinding of coal, coke, limestone, etc., and are, for most cases, far superior to other types of crushing equipment. Weldmesh Ref. 31 has been found to be successful as a guarding to fit circular type machines. Weldmesh is manufactured exclusively by The B.R.C. Engineering Co.



In addition to generating current for the electric motors, the diesel engine also drives the excitation generator, battery charging generator, air compressor, hydraulic pumps, and front wheel ventilation blowers.

To cut haul length and reduce road maintenance expense, the truck is designed to take grades up to 15 per cent fully loaded. Dumping is accomplished through a pair of three-stage cylinders.

Through use of a kingpin hitch between the two-wheel tractor and the two-wheel trailer, independent oscillation of tractor and trailer provides a high degree of manoeuvrability when turning in restricted areas. Positive hydraulic power steering permits a maximum turning angle of 60 deg., left and right. According to the manufacturer, a 50 ft. wide highway is sufficient for the truck to make a full 180 deg. turn.

Dynamic braking on all four wheels utilizes wheel motors as generators and dissipates vehicle kinetic energy into air cooled resistors. No friction brakes are required for downgrade operation. Parking and emergency brakes employ hydraulic aircraft disc types on all four wheels.

Rear dump specifications list capacity as 36 yds. struck, 42 yds. heaped (3:1). Bowl measures 21 ft. long, 13 ft. wide and 7 ft. deep. Loading height, with standard tyres, is 11 ft. 8 in.

The vehicle has a conventional arrangement of steering wheel, foot throttle, brake pedal and other controls.

U.S. SHAFT SINKING RECORD

Kermac Nuclear Fuels Corporation has set up a new U.S. record for shaft sinking at its Section 17 uranium mine in Ambrosia Lake, New Mexico, according to the *Mining World*. A round ventilation and manway escape shaft, 810 ft. deep and 44 in. in dia., was drilled from surface and completely lined with $\frac{1}{2}$ in. thick steel casing in 24 days.

A Hughes Tri-Cone rock bit was used to drill a 12 $\frac{1}{2}$ in. dia. hole to a depth of 838 ft., which allowed an extra 28 ft. for accumulation of broken bits, etc., so that they did not interfere with reaming. Drilling of this pilot hole was done in three days, and surveying showed it to be only 30 mins. from vertical. Reaming was then continued to the full 44 in. dia. in one pass, using a special reaming bit body mounting 12 Hughes rolling shaft cutters in four rings. Sixty of these shaft cutters were used in reaming the hole. The reaming bit also was equipped with a series of roller reamers on its side to maintain hole diameter, which served as a stabilizer during reaming. Rate of reaming was from five to seven ft. of hole per hour.

The pilot bit was mounted on the bottom of standard 5 $\frac{1}{8}$ in. drill pipe, which also served for rotating the reaming bit. The drill pipe was centred by using a 42 in. hole guide, which prevented whipping. Flushing was not found to be sufficient, however, although drilling mud was circulated at 1,200 g.p.m., and it is planned to increase this rate on the next operation.

To obtain the necessary weight to force the cutters into the rock, a 21 ton, 40 in. outside dia., $\frac{1}{4}$ -steel wall lead-filled drill collar, 8 ft. 10 in. long was mounted immediately above the bit body, which was found quite adequate.

Equipment Digest

Wire line core barrels of a new design introduced by the E. J. Longyear Co., United States, recover cores up to 25 per cent larger in dia. than the original wire line barrels. The new series 10 wire line barrels increase core size to 15/16, 1-5/16 and 1-23/32 in. for AX, BX and NX wire line barrels respectively, but drill the same size holes as the old AX, BX and NX designs.

Narrower kerfs of bits used with the new wire line barrels reduce the carat weight of diamonds by 10-20 per cent compared to the previous wider kerfs, and also help to increase penetration speed and bit life. The series 10 wire line barrels replace the original series but the wire line drill rods have not been changed.

Practical trials have begun at New Lount Colliery, Leicestershire, with a new control device which uses gamma rays as a probe to determine the thickness, direction, and undulations of the coal strata. The "midget miner", as it is known, is fixed to the cutting machinery and registers on a dial any change in the coal seams, directing the knives away from rock and other unproductive areas. The experiments are in the very early stages.

An electronic sensing device is being used in the shaft sinking operations at New Broken Hill Consolidated Ltd., Australia, to give an instant warning to winder drivers when a bucket moves away from its crosshead or traveller. The device is also being installed on cages, according to a report in *The Conveyor*. Trial tests of this application have been held on the auxiliary cage in the service shaft, N.B.H.C. Ltd. It is planned to extend the protection to other cages, skips, and counterweights in use.

The equipment uses a high-frequency signal generated at traveller or cage and fed into the steel hoisting rope from a nearby coil. The device fails to safe. The system can also be made to switch off the winder automatically. This possibility is being investigated.

A new method of determining depth of overburden and rippability of rock has been developed by Caterpillar Tractor Co. in the United States. Engineers of Caterpillar of Australia Pty. Ltd. have now been using a refraction seismograph for over three months on various earthmoving projects and quarries throughout Australia. They have reported considerable success with the method. Caterpillar Tractor Co. has over the last eighteen months developed a speedy and inexpensive method of determining the rippability of rock down to depths of 200 ft. below the surface. At the same time the extent and nature of various rock horizons can be estimated to a high degree of accuracy. The instrument used for this work is a small portable refraction seismograph.

The theory of this new refraction seismograph system to determine rippability is based on the principle that the velocity of sound waves through rock varies directly with the degree of "consolidation" of the rock.

The Sala personal safety block by Neldco Processes Ltd., now available for the first time in England, gives complete security to operators in high places. The block contains 16 ft. of steel wire rope, spring loaded and controlled by a braking device. It can be quickly fixed anywhere and has a locked hook for simple attachment to the worker's safety belt. The rope is always taut but in the event of a fall the brake operates and the man is gently brought to a stop within 12 in. and supported. Developed by one of the largest mining companies in Europe, the Sala safety block has already prevented, it is claimed, serious accidents.

As a result of many years' experience in the field of automatic control, Lindars Automation Ltd. have developed a new and improved version of their range of electro-pneumatically operated slides for material flow control. The units are of robust fabricated mild steel construction, and complete with air cylinder, solenoid operated air valve, open and closed position detection switch, and an air release valve for emergency hand operation and maintenance.

The design precludes the possibility of jamming by the elimination of guides, the slide plate bearing on rods when mounted beneath conveyor outlets, and on rollers when mounted at bin or mixer outlets; easy fixing is ensured by its double flanged construction.

Six standard sizes range from 4 $\frac{1}{2}$ in. x 4 $\frac{1}{2}$ in. to 18 in. x 18 in. and they are available as single units or as part of complete control installations.

An important step towards meeting rapidly increasing requirements for automation in the steel and allied industries has been taken by Associated Electrical Industries Ltd. and Davy-United Ltd.

These two companies have announced the formation of a jointly-financed Steelworks Automation Unit to apply new automatic control techniques to the processing both of steel and of non-ferrous metals. The problems involved in full automation in the steel and allied industries are, however, too complex for any single existing manufacturing organization to deal with adequately within its own resources. AEI has therefore allied with Davy-United to establish this combined unit, which has been specifically organized with such problems from the stage of the initial design study to the commissioning of a fully-operational production system in a plant.

The new Steelworks Automation Unit will be able to undertake comprehensive automation projects which can be expected to offer considerable long-term benefits in improved productivity and economy of operation. Such projects will include the combination of advanced servo controls with computers to ensure optimum performance of rolling mills and associated plant.

The AEI/Davy - United Steelworks Automation Unit has its headquarters at Mill Road, Rugby, with representatives both at Davy-United Ltd., Sheffield and at AEI Heavy Plant Division, Rugby.

MINING MISCELLANY

Mr. Miroslav Smok has been named as the Minister for Mines in the new Czech cabinet.

Mexican mineral production for 1959, according to a report by the Camara Minera de Mexico, is given as follows: coal, 1,585,900 tonnes (7.6 higher than in 1958); sulphur, 1,338,400 tonnes (0.5 per cent higher); iron, 535,300 tonnes (13.5 per cent lower); zinc, 263,900 tonnes (18 per cent higher); lead, 190,700 tonnes (5.6 per cent lower); manganese, 76,900 tonnes (2.1 per cent lower); copper, 57,300 tonnes (11.8 per cent lower); graphite 27,800 tonnes (410 per cent higher); arsenic 10,500 tonnes (237.7 per cent higher); antimony, 3,300 tonnes (19 per cent higher); silver, 1,400 kg. (7.3 per cent lower); mercury, 600 tonnes (27.4 per cent lower); cadmium, 600 tonnes (25.4 per cent lower) and gold, 9,756 kg. (5.8 per cent lower).

The Chief Inspector of Machinery, Federation of Malaya, reports that five out of the eleven new Chinese mines in the State of Perak had installed hydro-cyclones and jigs for concentration of the ore. In the Ipoh locality some 25 gravel pump units now employ jig plants with hydro-cyclones in preference to the traditional palong, or sluice-box.

It is reported that the first shipment of concentrates from a pilot scheme to reopen a copper mine in the Headlands district of Southern Rhodesia is being sent to Federal Germany.

A party of ten German mining students is visiting the Warwickshire coal-field from August 9-17, as students of the National Coal Board.

The foundation stone has been laid in Taranto of a new Italian ferrous metals combine, with an initial capacity of some 1,000,000 tonnes of crude steel, and eventual production rate of 3,000,000 a year. Raw materials to be consumed at the plant annually are estimated at 2,000,000 tonnes of iron ore, 1,200,000 tonnes of hard coal and 400,000 tonnes of limestone.

According to statistics issued from Moscow, some 5,400,000 tonnes more of iron ore, and the same amount more of coal were produced in the Soviet Union in the first half of 1960, than in the corresponding period of 1959. Coal production increase, which was 2 per cent, was the lowest in the industrial field. Production increases were also announced over the period for pig iron, 1,900,000 tonnes; rolled goods, 2,200,000 tonnes; raw steel, 2,700,000 tonnes; mineral oil, 9,000,000 tonnes (15 per cent higher); and gas, 5,000,000,000 cu. m. (29 per cent higher).

Bayerische Berg- Hütten- und Salzwerke A.G. of Munich announces that it has started examination of uranium ores at its Silberfeld mines in Bavaria.

The Norwegian State-owned mining concern, Rana Gruber A/S, which has been operating a pilot ore exploitation and processing unit in the North Norwegian Dunderlandsdalen district, has now placed plans for a full-scale mining project before the Storting. (Norwegian Parliament.) The area initially concerned is estimated to have reserves of 70,000,000 tonnes of 30 per cent iron ore, with further deposits of between 100,000,000 and 200,000,000 tonnes, also about 30 per cent content. The pilot plant was operating at an annual capacity of only 60,000 tonnes of crude ores; the proposed plant, costing about £10,500,000, would have 750,000 tonnes annual capacity by 1967, involving the exploitation of some 1,900,000 tonnes of ore annually.

Dr. Estonsore, President of Bolivia, announced recently that negotiations are being held with West Germany on possible financial participation by that country in Bolivian mining projects.

The Hungarian Statistical Bureau in a report issued in Budapest, states that industrial output in Hungary over the first half of 1960 included 579,000 tonnes of bauxite, 28 per cent more than in the same period of 1959; 13,100,000 tonnes of coal, 24,600 tonnes of refined aluminium, 945,000 tonnes of crude steel, 592,000 tonnes of rolled steel, 574,000 tonnes of crude oil and 3,700,000 kWh. of electrical energy. Overall industrial output rose by 15 per cent over the period.

The discovery of a rich gold reef, 14 miles from Hunters Springs at Barrington Tops, on a mountain range about 200 miles north of Sydney, is attracting a large number of amateur prospectors. Two brothers, Messrs. Joseph and Sydney Wright discovered the deposit about six months ago, and have estimated that the reef would yield an average of 20 oz. per ton of quartz. A government report is expected shortly.

A high-grade uranium ore deposit, in a layer about 300 m. long, has been discovered in Katamo, Tottori Prefecture, Japan. The Geiger reading of the deposit is reported as 35,000 counts an hour, three times higher than deposits previously discovered by the Atomic Fuel Corporation. The ore registered a 56.6 per cent uranium deposit.

Ores are among the main items on the list of Albanian products to be exported to Italy under a trade agreement covering a 12-month period from mid-1960 to mid-1961 between the two countries.

Work has begun on a titanium dioxide plant at Umbogintwini on the Natal South Coast by South African Titan Products (Pty.), a company formed by British Titan Products Co., and African Explosives and Chemical Industries. The plant is expected to be ready by the beginning of 1962, and will have a capacity of 10,000 tons annually. The estimated cost is £3,000,000.

The International Co-operation Administration is making an investigation into Uganda's wolfram mining industry, at the request of the Uganda Mines Department. Questions of increasing efficiency in the mining, milling and extraction processes will be studied.

Kilembe Mines, in Western Uganda, are expected to produce 14,000-15,000 tons of copper during 1960, compared with 12,000 tons in 1959.

The High Authority of the European Coal and Steel Community announces from its Luxembourg headquarters that it has granted a further \$U.S.484,000 for ore prospecting in Africa in 1960-61. The money will be spent on continuing exploration work on the Ivory Coast and in the Cameroons, Gabon, and the Congo state which was formerly French Congo. In 1958 a total of \$5,000,000 was granted for such expenditure and up to now \$1,800,000 had been issued.

The Susquehanna Corporation of Chicago announces that it has entered into option agreements with Raindor Gold Mines of Toronto to conduct exploration of Raindor's Canadian mining properties. These consist of gold, silver, lead, zinc and minor deposits of copper and cadmium near Revelstoke, B.C. Susquehanna will conduct Canadian operations through a wholly-owned subsidiary, Susquehanna Metals, whose president, Mr. Allen Gray, said that the option will only be exercised if sufficient ore is proven to support an integrated mining and milling operation. In the U.S., Susquehanna operates several mining properties and two uranium ore processing plants.

The Norwegian firm of Norsk Hydro A/S of Oslo, has announced that it is planning to increase production capacity for magnesium metal to 14,000 tonnes a year.

The new Lind-Greenway iron ore mine has been brought into operation in Minnesota by the Jones and Laughlin Corporation, U.S. fourth largest steel producer. The mine will produce some 700,000 tons of high quality iron ore annually and provide 10 per cent of the ore consumed by the Jones and Laughlin concern. The Lind-Greenway site, which will employ about 200 workers when in full production, will replace the company's Columbia mine, which is now almost exhausted, and is to be closed.

The directors of Western Mining Corporation announce that drilling over only a small part of the company's bauxite area in the Darling Ranges of Western Australia had already indicated reserves of 37,000,000 tons of bauxite. They added that through their company's subsidiary, Western Aluminium, they were negotiating to sell bauxite to three Japanese aluminium producers, and an agreement had been reached on three trial shipments of 10,000 tons each to start soon.

The Archduke Felix of Austria, who is visiting Lima on behalf of the Syndicat Belge d'Entreprises a l'Etranger (Sybetra) has submitted to the Sociedad Nacional de Minería y Petróleo a formal offer for the financing and construction of a zinc smelting and refining plant in the mining region of the central Andes at a cost of \$10,000,000. The plant, using the Belgian patented "over pelt" process, would have a productive capacity of 30,000 tons a year. Sociedad Nacional is calling a meeting of Peruvian zinc producers to discuss the proposal.

A company, Faryab Mining Co., of whose shares 51 per cent belong to Iran Chromite Co., and 49 per cent to Philipp Bros. Ore Co., of New York, is to undertake the exploitation of chrome ore deposits in the Shariad and Shahine areas, some 80 miles north-east of Bandar Abbas, in south-east Persia, as soon as roadwork and equipment are ready. Iran Chromite Co. already mines chrome ore near Sabzevar in north-east Persia, and at another site near Bandar Abbas.

A new "Geology of Norway", edited by Professor Olaf Høltedahl, and a set of seventeen "Guide Books" for geologists in Norway, are now available in English.

Mr. Murray Watts, president of Murray Mining Corporation is reported by the *Northern Miner* as stating that the company's Ungava area drilling programme had more than doubled its previous indicated asbestos-bearing tonnage. Overall reserves are now placed at about 7,800,000 tons, grading \$20.0 per ton in the "A" zone. While drilling is being continued, the company is also starting a programme designed to secure a large representative bulk sample for test and marketing purposes, which it hopes to achieve this year. It is planned to continue drilling until over 9,000,000 tons is indicated before proceeding to formulate actual production plans. A preliminary report estimates that a total capital outlay of \$43,900,000 would be needed to place the property into production, including a contingency allowance and supervision and engineering costs. However, this could be reduced to around \$38,000,000 through anticipated government aid.

The U.S. Air Force has awarded a contract to Hamilton Standard, a division of United Aircraft Corporation, to study welding of molybdenum and tungsten by electron beams. Hamilton Standard holds North American rights to electron beam welding and cutting equipment developed by the Carl Zeiss Foundation of West Germany.

The Rhenish-Westphalian Institute of Economic Surveys stated recently that West Germany's consumption and exports of coal had risen to such an extent that stocks would be reduced to less than 14,000,000 tonnes by the middle of June (excluding the Saar area) from 17,200,000 tonnes which they had reached last November. Industry used about 2,000,000 tonnes of coal, 11.6 per cent more in the first three months of 1960 than in the same period of 1959. Exports to countries not members of the E.C.S.C., rose by 11.7 per cent in the first four months of 1960, compared with the same period in 1959.

Coming Events

The Institution of Mechanical Engineers is arranging for a Symposium in London of the British papers which were presented at the First International Congress of the International Federation of Automatic Control, held recently in Moscow. The Symposium under the sponsorship of the British Conference on Automation and Computation, will be held on September 27 and 28. In addition to the discussion of the papers, it is planned to report briefly the more important contributions to the Moscow Congress.

The British Institute of Management is holding a Conference in Harrogate from November 16-18 next, on "Selling Capital Goods". Papers will discuss the export of capital goods to underdeveloped countries, overseas competition, the effect of the European Common Market on exports and restrictive practices in the export market; other papers will include: "Overseas Sales and Service", "The development of selling ability", "Long term repayment as an aid to selling", and "Market survey work in light and heavy capital goods". Sir Leslie Robinson of the Board of Trade will give the closing address at a dinner on November 18.

A Symposium on Mechanization of Mines in India has been arranged, and will be held at the Central Mining Research Station early in 1961. Subjects proposed for discussion will be under the following main headings: Winning, methods of work and detailed operations; Conveying and transport of coal and minerals; Ventilation, blasting and allied subjects; Supports, roof control stowing, roof bolting, etc.; and Safety and health. Further details may be obtained from the "Journal of Mines, Metals and Fuels", 6/2 Madan Street, Calcutta 13, India.

A 60-member committee, composed of mining men from all parts of the U.S., will draft a Declaration of Policy representing the mining industry's views on national issues, for consideration at the 1960 Metal Mining and Industrial Minerals Convention and Exposition of the American Mining Congress in Las Vegas, Nev., October 10-13 next.

The International Organizing Committee in Warsaw and the Czechoslovak Academy of Sciences in Prague have arranged for the Second International Mining Congress to take place in Prague, Czechoslovakia, May 14-20, 1961. Enquiries for further information should be addressed to Professor J. T. Whetton, Mining Department, Leeds University.

The Board of Trade and the Birmingham Engineering Centre are jointly organizing a British engineering exhibit at the National Industrial Production Show of Canada, to be held in Toronto, May 8-12, 1961.

Personal

Mr. H. A. A. While, manager of the London office of the United Steel Companies, has been appointed general export manager, in succession to Mr. E. B. Rees, who has resigned as export manager for health reasons, but will continue as consultant.

Mr. G. E. Smith, director of production for the Perkins Group, has been appointed assistant managing director of the Hamworthy Engineering Co. Mr. T. H. R. Perkins, managing director of Perkins Engines, is appointed temporarily as director of production and Mr. J. M. Collins, export sales manager of Perkins Engines, will become acting director of marketing for the Perkins Group.

Mr. P. L. Melliar - Smith, Chief Inspector of Mines, Federation of Malaya, has left Malaya on retirement. Mr. J. R. Lee, the former Deputy, has assumed duty as Chief. Mr. A. W. Burne, formerly Senior Inspector of Mines, North Zone, is the new Deputy.

Mr. W. H. Everard, deputy general manager of the foundry division of Edgar Allen and Co., has been elected president of the British Electric Steel Makers' Guild.

Mr. W. R. Booth, assistant treasurer of Goodyear Tire and Rubber Co., of Akron, Ohio, has also been appointed treasurer of the Goodyear International Corporation.

Wolverhampton Metal Co., have announced that Mr. D. P. C. Neave has been appointed vice-chairman of the company.

The National Coal Board has announced the following appointments: Mr. D. J. Ezra has been appointed director-general of marketing in succession to Mr. F. Wilkinson, who was appointed marketing member of the Board in June this year; Mr. W. V. Sheppard has been appointed director general of production and reconstruction. The production and reconstruction departments at national headquarters are being merged and Mr. Sheppard, who was director-general of reconstruction, will now be responsible for the combined departments; the former director-general of production was Mr. H. A. Longden, who has been appointed chairman of the Board's West Midlands Division. He succeeds Mr. E. H. Browne, who has been appointed a deputy-chairman of the National Coal Board.

The Traction Division of Associated Electrical Industries announces the appointments of: Mr. J. H. Cansdale, Sales Manager; Mr. J. C. Way, deputy sales manager, Mr. J. Roston, assistant sales manager, these appointments take effect from July 1, 1960.

Metals and Minerals

Alcoa's Marketing Changes

Two days after raising prices on certain alloy ingot and mill products (vide our issue of last week, p. 155), Alcoa announced a combination of developments which, in effect, appear to lower its prices to buyers of primary ingot. The announcement stated that the company had completed a programme to improve the quality of aluminium produced for customers at its primary smelting plants and was abandoning the term "pig" as a designation for primary products.

Henceforth products formerly designated as "pig" will be produced by methods formerly used for the production of aluminium ingot. These products, it was stated, will have improved qualities including better appearance, greater internal cleanliness and more uniform composition available up to now only in ingot, but will be sold at the former pig price level. The primary product formerly known as "pig" has been priced at 26 c. a lb. for metal of 99½ per cent minimum purity. Primary ingot has been ranged from 28.10 c. a lb. and upwards, depending on purity and size of ingot. The new arrangement means that the fabricator who has been buying primary ingot will get the same product for less money, while one who has been buying pig will get an improved product for the same price.

In reporting this development, *American Metal Market* recalls that for many years, in the industry's infancy, ingot was the basic primary form, the term being applied to the raw metal as it came from the pots. The metal was then fluxed and further processed to remove oxygen, metallics and other impurities, in order to advance it to the ingot category. In time, a rising number of users installed their own equipment, capable of processing and alloying aluminium to fit individual needs. This resulted in an expanding market for aluminium in pig form, at a saving in initial cost. By the end of World War II, more pig than aluminium ingot was being sold, and pig became the standard for base pricing. At the same time, improved techniques in production enabled the industry to step up purity of the primary aluminium to a guaranteed 99.5 per cent for both pig and ingot. For normal working purposes it was desirable to buy the higher-priced ingot only for specialty fabrication.

Nowadays only about 1 per cent or less of all primary aluminium sales are in the form of ingot; hence, any implied cut is of little account to more than a handful of buyers. For this reason, other companies can be expected to take similar action. There has also been some indication that the classifica-

tion of "billet" might also be abandoned eventually by the industry.

Some other major producers claim that, in classifying all primary products as "ingot", Alcoa is putting into formal practice a device which Alcoa and themselves have been following for years—in essence, selling a higher-grade product for the pig price. Kaiser states that it has been doing this since the Korean War and Alcan that it has done so since World War II. The latter company has not used the term "pig" for a long time, if at all.

In preparation for this step, Alcoa has been engaged for three years on a multi-million dollar programme involving the installation of new furnaces and casting machines, with ancillary equipment, at its smelters.

Aluminium Sales Inc., the U.S. sales subsidiary of Aluminium Ltd., has adjusted its prices to U.S. customers in line with the similar price changes recently made by the U.S. producers. Alcan extrusion ingot is increased by 3/10c. per lb. and prices for certain foundry alloys were also adjusted. No change is being made in the company's price for commercial grade aluminium ingot, which remains at 26c. per lb. for 99½ per cent ingot, the same price as that charged by American producers.

THE QUICKSILVER MARKET

After having been quotably unchanged at £70 to £70 10s. a flask since the second half of June, the London ex-warehouse quicksilver price is now indicated at from £69 15s. to £70 5s. The level of fresh demand in the U.K. is seasonably quiet, while it is understood that the agent for Spanish metal is now in a position to offer spot supplies. In the circumstances, the possibility of the present price range being shaded cannot be entirely ruled out.

In the first six months of this year the U.K. imported about 11,423 flasks compared with some 11,068 flasks in the comparable period of last year. Overseas buying is keeping up very satisfactorily.

The only other item of interest in an otherwise uneventful market has been the recent offer of up to about 300 flasks of the metal by the Atomic Energy Authority. Buyers have already submitted their bids and are awaiting replies.

FALL IN URANIUM PRICE

Barclays Bank D.C.O. reports that the vice-chairman of South Africa's Atomic Energy Board, Dr. T. E. W. Schumann, has drawn fresh attention recently to the fact that South Africa's contracts for the sale of uranium oxide to the Combined Development Agency at a price of 84s. per lb. would lapse during the years 1964-66. In recent years, he stated, the world price of the material had declined considerably and Canada had recently sold uranium to Japan at 35s. per lb. After the termination of these contracts, therefore, the Union would also be adversely affected by the drop in price of the mineral which, at the current rate of production of about 6,200 tons of oxide per annum, is earning the country over £50,000,000 per annum.

Dr. Schumann added that a favourable change in the world demand for uranium was generally expected by 1970, with consequent advantages for South Africa.

LONDON METAL AND ORE PRICES, AUGUST 11, 1960

METAL PRICES

Aluminium, 99.5%, £186 per ton
Antimony—
English (99%) delivered, 10 cwt. and over £190 per ton
Arsenic, £400 per ton
Bismuth (min. 1 ton lots) 16s. lb. nom.
Cadmium 10s. 6d. lb.
Cerium (99%) net, £15 0s. lb. delivered U.K.
Chromium, Cr. 99% 6s. 11d./7s. 4d. lb.
Cobalt, 12s. lb.
Germanium, 99.99% Ge. kilo lots 2s. 5d. per gram
Gold, 249s. 11½d
Iridium, £23/£26½ oz. nom.
Lanthanum (98%/99%) 15s. per gram.

Magnesium, 2s. 2½d./2s. 3d. lb.
Manganese Metal (96½/98%) £275/£285
Nickel, 99.5% (home trade) £600 per ton
Osmium, £20/£25 oz. nom.
Osmiridium, nom.
Palladium, imported, £8 12s. 6d.
Platinum U.K. and Empire Refined £30 5s.
Imported £28½/28½
Quicksilver, £70/£70½ ex-warehouse
Rhodium, £44/£48 oz.
Ruthenium, £14/£20 oz. nom.
Selenium, 50s. 0d. per lb.
Silver, 79½d. f. oz. spot and 79½d. f'd
Tellurium, 25s. 0d. lb.

ORES AND OXIDES

Antimony Ore (60%) basis	20s. 6d./21s. 6d. per unit, c.i.f.
Beryl (min. 10 per cent BeO)	235s./240s. per l. ton unit BeO
Bismuth	65% 8s. 6d. lb. c.i.f.
.. .. .	18/20% 1s. 3d. lb. c.i.f.
Chrome Ore—	
Rhodesian Metallurgical (semifriable 48%) (Ratio 3:1)	£15 5s. 0d. per ton c.i.f.
" Hard Lumpy 45% (Ratio 3:1)	£15 10s. 0d. per ton c.i.f.
" Refractory 40%	£11 0s. 0d. per ton c.i.f.
" Smalls 44% (Ratio 3:1)	£13 5s. 0d. per ton c.i.f.
Baluchistan 48% (Ratio 3:1)	£11 15s. 0d. per ton f.o.b.
Colubinite, Nigerian quality, basis 70% combined pentoxides (Ratio 10:1)	Nb ₂ O ₅ : Ta ₂ O ₅ 180s./185s. per l. ton unit c.i.f.
Fluorspar—	
Acid Grade, Flotated Material	£22 13s. 3d. per ton ex. works
Metallurgical (75/80% CaF ₂)	156s. 0d. ex. works
Lithium Ore—	
Petalite min. 3½% Li ₂ O	50s. 0d./55s. 0d. per unit f.o.b. Beira
Lepidolite min. 3½% Li ₂ O	50s. 0d./55s. 0d. per unit f.o.b. Beira
Amblygonite basis 7% Li ₂ O	75s./85s. per ton f.o.b. Beira
Magnesite, ground calcined	£28 0s./£30 0s. d/d
Magnesite Raw (ground)	£21 0s./£23 0s. d/d
Manganese Ore Indian—	
Europe (46%-48%) basis 67s. 6d. freight	73d./75d. c.i.f. nom.
Manganese Ore (43%-45%)	69d./71d. c.i.f. nom.
Manganese Ore (38%-40%)	nom.
Molybdenite (85%) basis	8s. 11d. per lb. (f.o.b.)
Titanium Ore—	
Rutile 95/97% TiO ₂ (prompt delivery)	£28 0s. 0d. per ton c.i.f. Aust'n
Ilmenite 50/52% TiO ₂	£11 10s. per ton c.i.f. Malayan
Volfgram and Scheelite (65%)	156s./162s. per unit c.i.f.
Vanadium—	
Fused oxide 95% V ₂ O ₅	8s./8s. 11d. per lb. V ₂ O ₅ c.i.f.
Zircon Sand (Australian) 65-66% ZrO ₂	£16/£16 10s. ton c.i.f.

West Germany's Minister of Nuclear Energy, Dr. Siegfried Balke, stated recently in Ottawa that Canadian uranium producers should not be too optimistic about his country as a market. He warned that Germany would not be a potential market for large quantities of the metal for many years. Even if Germany goes ahead with its plan to build three medium-sized atomic power plants, they will use only 140 tons of uranium annually. They will not be built for several years and there are no plans for any additional plants, especially those producing large quantities of electricity.

ANTIMONY IN BRISK DEMAND

A firmer tone has recently been discernible in the open antimony ore shipment market, where quotations are reported to have firmed up under the influence of keen interest from Western Germany and other Continental sources together with substantial purchases by Japan. The U.K. price for 60 per cent ore remains unchanged at from 20s. 6d. to 21s. 6d. c.i.f. This country's requirements are mostly drawn from South Africa under long term contracts.

Imports of ore and concentrates (including crude antimony) into the U.K. from all sources over the period January-June, 1960, totalled 9,228 tons, compared with 5,370 tons over the corresponding period of last year, according to Board of Trade statistics.

During the first five months of 1960 U.K. consumption of new antimony metal totalled 2,549 tons against 1,916 tons in the corresponding period of 1959. Reflecting the upward trend in consumption, which appears to be world wide, has been the improvement in the

U.K. market for Chinese metal, which for the past two or three months has been in more active demand than for some considerable time. Chinese metal prices are currently quoted at £135-£138 per tonne c.i.f. for 99 per cent regulus and £141-£144 for 99.6 per cent. At the beginning of the year the corresponding quotations were £134-£137 and £137-£141 (all subject to £40 a ton duty).

Chinese antimony is apparently succeeding in penetrating the U.S. barriers against Communist goods. According to *American Metal Market* it is being offered at 3 to 4c. below the domestic price of white antimony oxide—26.50c. per lb. for carload lots and 28.00 c. for l.c.l. quantities. The material is described as a mixture of Chinese with some other European-produced oxide. Apparently the "mixing" is being done in France. The oxide is then transferred to Amsterdam and shipped from that port under the designation "Made in Belgium."

These illegal shipments are ascribed to a sharp increase in the demand for white antimony oxide which has been noted in recent months. Porcelain enamel is one field in which the oxide is reported to be in growing use. It is also being used to an increasing extent in curtain wall construction, home swimming pools, and a number of other applications. Imports of high grade Bolivian ores are insufficient to meet the present demand.

A few months ago Chinese metallic antimony started flowing to Canada, importation being permissible under current trade agreements. It is reported to be selling there at around 19.50 c. per lb. or approximately 6 c. less than the consumer in Canada pays for metal of European origin.

Nothing new has developed in the wage talks either in Chile or in Northern Rhodesia, where the next meeting is scheduled for the middle of the month.

UNSETTLED TIN MARKET

Tin prices in London ended the week on an unsettled note and a sharp downward reaction took place following declines in Singapore over the weekend. The lower prices after a steady upward movement effected sentiment to a certain extent but prices tended to recover as Continental buyers came into the market. U.K. stocks in official warehouse fell last week 86 tons to 9,555 tons.

On Thursday the Eastern price was equivalent to £820½ per ton c.i.f. Europe.

LEAD CONTANGO WIDENS; ZINC STOCKS RISE

Influential selling of lead has been more pronounced than of late during the week and in the absence of large consumer interest the contango has widened. Zinc is also suffering from a lack of outside demand and the maintenance of a small backwardation indicates that there is no undue pressure on the nearby position.

The month-old strike at certain Zinc Corporation Ltd.'s properties in Australia was settled during the week but the new Jersey Zinc Co. has announced that several of its smelters have closed as a result of strike action. It is estimated that this new strike will entail an output loss in the region of 10,000 tons a month while the continued strike at Bunker Hill has reduced production there by about 6,000 tons per month. However, these strikes are, under present conditions, unlikely to have any very great effect on the market as stocks of zinc on hand with U.S. producers last month showed an increase of about 20,000 tons at 207,059 tons compared to 187,686 at the end of June. Production at 73,754 tons exceeded total shipments of 54,381 tons by approximately the same amount.

Lead production in O.E.E.C. countries was lower in June at 54,204 tonnes compared with 60,655 tonnes in May and in consequence stocks declined to 62,621 tonnes compared with 69,299 tonnes. Zinc production also showed a modest decline in June at 78,917 tonnes compared with 79,306 tonnes in May but stocks increased to 57,601 tonnes compared with 54,512 tonnes.

Closing prices are as follows:

	August 4		August 11	
	Buyers	Sellers	Buyers	Sellers
COPPER				
Cash	£251½	£252	£245	£245½
Three months ..	£248	£248½	£244½	£245
Settlement ..		£252		£245½
Week's turnover		6,575 tons		8,475 tons
LEAD				
Current ½ month	£70½	£71	£70	£70½
Three months ..	£71½	£71½	£70½	£71
Week's turnover		4,400 tons		6,725 tons
TIN				
Cash	£812	£813	£803½	£804
Three months ..	£813	£813½	£805½	£806
Settlement ..		£813		£804
Week's turnover		610 tons		715 tons
ZINC				
Current ½ month	£89½	£89½	£88½	£88½
Three months ..	£89	£89½	£88½	£88½
Week's turnover		2,225 tons		3,575 tons

COPPER • TIN • LEAD • ZINC

(From Our London Metal Exchange Correspondent)

It has been another quiet week on the market and in the absence of any fresh developments prices generally, with the exception of tin, have been maintained at recent levels. Whilst business is indisputably quiet at the present time, it is no more than is customary during the main holiday month. The main question, however, is when the revival in interest will take place, as there is a strong body of opinion which does not expect any real improvement to be noted until the early part of the last quarter of the year.

COPPER BACKWARDATION NARROWER

Copper consumers have continued to maintain a wait-and-see attitude in view of the confused situation in the Congo and in Katanga in particular. Whilst the possibility exists that certain delays at least will occur in deliveries of copper from the sole Congo producer, the impact of which would be most felt in Europe, the London market, reflecting the views of consumers, has taken this factor in its stride.

Apart from the effect of the holiday season on demand and the fact that many consumers took the precaution of

building up their stocks early in the summer, the factor of over-riding importance at the back of the market is the knowledge that the relaxation of U.S. export restrictions enables U.S. refined metal to be shipped against sales on the London Metal Exchange. With U.S. production running normally after the prolonged strike which started just a year ago and with stocks accumulating, this change of attitude should go a long way towards preventing the technical positions in London and the consequent erratic price movements which have occurred in the past.

The main feature here has been the further narrowing in the backwardation in the face of some influential offerings of cash metal and a further increase in U.K. warehouse stocks last week of 500 tons to 5,854. The increase in recent weeks have at any rate sufficed to remove the threat of a "squeeze" and the present adequacy of supplies has eliminated the premium on electrolytic wire-bars. U.S. reports indicate that quiet conditions persist in the consumer sphere with both the main producers and custom smelters finding business slow, although some quarters cautiously predict an improvement towards the end of the year. Recent small offerings of scrap resulted in the smelters increasing their price ¼ c. to 25½ c. during the week.

Mining Finance

U.S. Faith in Tsumeb

Tsumeb, a highly-profitable base metal producer in South-West Africa, gets relatively little publicity because there is no market in the 5s. shares of which there are 4,000,000 in issue. Selection Trust and Union Corporation have, however, important stakes in Tsumeb which has paid dividends totalling 21s. for the year to June 30, 1960 against 23s. 6d. in 1958-59. Selection Trust holds 14.25 per cent of the capital. The extent of Union Corporation's holding has not been disclosed, but it is believed to be of much the same calibre. Tsumeb is controlled by American Metal Climax and Newmont Mining Corporation which each have a 28.5 per cent interest. It produces a complex ore containing lead, copper and zinc together with important by-products including cadmium, silver and that very modern material, germanium. Hitherto, the metals have been exported in the form of concentrates for smelting and refining. They are sent in roughly equal proportions to America and Belgium. Sales agents in the U.K. are the Anglo Metal company.

The American controlling houses decided last year to erect a copper smelter at Tsumeb. The cost was put at £1,500,000. This smelter is now under construction and is expected to be ready for use some time in 1962. It is being designed so that, if necessary, copper-bearing material from

other mines in South-West Africa can be treated. Capacity will be 20,000 tons of blister copper per annum. It is also thought that additional production of germanium will be made possible.

The decision to put up the copper smelter was taken before the sharp deterioration in the South African political situation that has occurred, along with turmoil in many other parts of the African continent, during the current year. So it is a gesture of faith by the Americans that they have now decided that this smelter should be added to by a lead smelter and refinery. This, it is stated, will be adjacent to the copper smelter, will be designed to produce 80,000 to 90,000 tons per annum of refined lead with facilities for the recovery of silver, cadmium and arsenic, and should be in operation by mid-1963. No estimate is given of the extra capital cost of this new project.

When the whole scheme is completed Tsumeb should be in a much better economic position than it has hitherto been. For 1958-59 its profit after taxation was £4,314,000 against £4,226,000 in the preceding year and a bumper £7,013,000 in 1956-57. It is obvious that the management can have little worry about the property's life in the light of the latest news. The June, 1960, ore reserves have not yet been revealed, but at June 30, 1959, those above the 30th level, which is at a depth of 3,150 ft., were

put at 8,165,700 tons compared with a 1958-59 milling rate of 625,534 tons.

So there is a life of 13 years in sight on this basis alone. There are another 2,000,000 tons of probable ore "conservatively" estimated to lie below the 30th level although this is of considerably lower grade. Tsumeb is also conducting an exploration programme in other parts of the territory.

HONGKONG TIN TO RESTART DREDGE

When output restriction was at its height under the International Tin Agreement it was a hard time indeed for many of the smaller producers in Malaya and there were numerous casualties. Single-dredge concerns such as Hongkong Tin which were part of a group organization, Harrisons and Crosfield in this instance, were lucky, however, in that they were able to save money by closing down the dredge while at the same time obtaining some income from the allocation of their permissible sales quota to other members of the group. Hongkong, in fact, put its property on a care and maintenance basis in October, 1958. Since then under the profit-sharing arrangement it has more than covered the cost of maintaining the dredge and property "enabling the company to survive a period of severe restriction without material loss while retaining the remaining ore reserves unimpaired".

Now it has been decided to restart operations owing to "improving market conditions and the likelihood that quota releases will be progressively increased". It is anticipated that operations will begin about the middle of next month, but the dredge is expected to be in low-grade ground for approximately the first four months after which outputs should improve. Thus, it is not until the financial year ending in September, 1961, that any improvement can be expected in Hongkong's results. The company has been out of the dividend list since 1955-56. The 5s. units are 10s. 6d. The life of the property has been officially estimated at five to seven years.

GOLD MINES OF KALGOORLIE EARNS MORE

Gold Mines of Kalgoorlie, the Australian gold producer in the Western Mining group, has raised its profits quite substantially for the year to last March. This is officially stated to be due to an improved grade of ore milled and to profits from the sulphur contents of pyritic concentrates. The gross figure is up by £75,183 at £323,869. Tax takes £19,387 leaving a net surplus of £304,482 of which the 1s. dividend previously declared absorbs £202,265. The carry-forward remains substantial at £560,638 against £459,220 brought in. All these figures are in Australian currency.

What the preliminary statement does not reveal is to what extent the mine had to rely on aid under Australia's Gold Mining Industry Assistance Act. In the preceding year no less than £313,632 was received from this source. It was this aid, in fact,

LONDON MARKET HIGHLIGHTS

A much better feeling developed in the South African Gold share market last week. There was no spectacular rise in prices but there were very few sellers around and modest but persistent Johannesburg enquiry often encountered a shortage of stock. The rise in the South African Bank rate had been generally anticipated and thus had very little effect on Cape sentiment.

A feature at the beginning of the week was the sharp revival in Winkelhaak which lifted the shares 1s. 9d. to 23s. 9d. The move was almost entirely London-inspired and followed Press comment on the rising earnings of this promising young gold producer.

Free State Geduld and Western Holdings reached the common price of 118s. 9d. by Wednesday evening, a recovery of 2s. 6d.; West Wits (53s. 9d.), Hartebeestfontein (43s.), and Anglo American (147s. 6d.) also showed useful improvements. Buffelsfontein reacted only slightly to 40s. 3d. following news of the underground fire which did not appear to be particularly serious.

Copper shares moved indecisively for a while, the movements closely following daily developments in the Congo situation. But political tension relaxed on Wednesday and this, coupled with a flurry of demand for Copper shares in New York, overnight produced a sharp recovery in what had become an oversold market here.

"Tanks" regained 1s. to 30s. 6d. and Chartered were 9d. better at 76s. 6d. Most interest, however, centred on Nchanga

which had been previously firm largely as a result of favourable Press comment to the annual report. Nchanga rose 2s. 7½d. during the three days to 57s. Rhokana moved up 1s. 10½d. to 49s. as a result of a reasonable view that the shares had been unjustifiably lagging behind Nchanga. A fair amount of local activity also developed in Union Minière at around 12½.

Tin shares, on the other hand, remained depressed. Each day brought a fresh crop of easier prices despite the fact that there was little selling and, more important, the earnings outlook for the companies remains as good as ever. The main reason for the downside was still a lack of fresh Eastern demand and this in turn stemmed from the fact that a good deal of recently bought stock had arrived in Singapore and needed to be paid for.

Among the losses, Gopeng came back 2s. 6d. to 23s. 3d., Ayer Hitam 1s. 6d. to 21s. 9d. and Tanjong 1s. 6d. to 24s. Sooner or later, it seems, the East will get over its current bout of indigestion and a sharp recovery in share prices could be in prospect. On this assumption, the current setback in Tins could provide a useful buying opportunity for those investors who missed the earlier rise.

Elsewhere movements were rather narrow. Some of the non-African gold shares like Lake View (26s. 3d.) and Yukon Consolidated (4s. 3d.) continued to attract buyers on gold price hopes. Ard at last St. John del Rey (78s. 9d.) began to recover from their recent downdrift.

(continued on page 188)

1860-1960

A century of service to the mining industry

One hundred years ago, two Scots, David Fraser, a millwright, and Tom Chalmers, a foundryman, foresaw great opportunities in supplying equipment to America's expanding mining industry. Together they set up a business in Chicago for the manufacture of crushing, smelting and general treatment plant. Thirty years later they formed a British company, Fraser & Chalmers Ltd., at Erith, Kent, to manufacture mining and handling equipment for the South African gold mining industry. Today Fraser & Chalmers forms part of the G.E.C. engineering organization, and with this background of a hundred years experience is ideally qualified to undertake the production and installation of all types of plant for the mining industries of the world.

G.E.C.

MINING FINANCE—continued

that enabled the profit of £248,686 to be made. The Act has been extended for another three years as from July 1, 1959, with an increase in the maximum subsidy rate payable to large producers from £2 15s. to £3 5s. an ounce. G.M.K. 10s. shares are quoted at 7s. 3d. and the yield after allowing for the exchange loss to U.K. holders is 11 per cent. The company's dependence on the subsidy probably accounts for this generous return.

GEEVOR'S PROFIT AND OUTPUT DOWN

Geevor Tin, the Cornish producer, reports lower profits for the year to last March. The preliminary statement does not give any reason for this setback. The average price received must almost certainly have been higher. Against this costs may have increased. But the predominant factor is likely to have been reduced output. The company's monthly returns show that 1959-60 production totalled only 648 tons against 683 tons in both the preceding year and the one before that. An explanation of this decline must await the full annual report.

Meanwhile, the year's dividend is cut from 3s. to 2s. 6d. per 5s. share. The final is 2s., but on this occasion last year's bonus of 6d. is omitted. The distribution takes slightly more than the net profit which comes out at £30,921 against £39,241 in 1958-59. The carry-forward is a small amount lower at £16,215.

Unlike Malayan and Nigerian producers, Geevor has been able to reap the benefit of the International Tin Scheme's propping up of the metal price without having had to suffer the inconveniences of restricting output, Britain being only a consumer member of the agreement. The company's biggest burden is probably that of U.K. taxation, a subject which the chairman understandably fulminates against annually. It has become a particularly sore point since the provision in the Budget whereby practically all non-U.K. producers are reaping the fiscal benefits of their qualification as Overseas Trade Corporations.

Geevor shares are 22s. 9d. cum the final dividend. The yield is 11.1 per cent. This looks reasonably generous, but buyers may not be particularly anxious to take advantage of it pending some reassurance in the full report that declining production is not to be a permanent feature of operations at this old mine.

RECORD RAND GOLD PRODUCTION

South Africa's gold production continues to reach new heights. The July total of 1,815,814 ounces is the best monthly figure yet and it brings the total for the first seven months of 1960 up to 12,356,612 ounces, which is not far short of a million ounces more than at this time a year ago when output eventually reached 20,000,000 ounces worth £246,000,000. A new peak for 1960 now looks a virtual certainty.

Profits from gold and uranium for the first half of 1960 have been announced by the Transvaal and Orange Free State Chamber of Mines. They are £7,600,000 up at £62,000,000 out of which £22,400,000 has been distributed in dividends. The African labour force keeps up well. At the end of July the number of Africans employed in the industry was 378,626 which compares with 381,190 a year ago.

CONS. ZINC STRIKE OVER

The labour strike at Australia's Zinc Corporation and New Broken Hill lead-zinc mines in the Consolidated Zinc Corporation group has been ended. The strikers decided to resume work at midnight on August 8. The strike began on July 12. It was not over a wage claim, but concerned a dispute about training courses being given to new employees. The men went back to work under an Industrial Commission ruling that they should do so on pre-strike conditions while the training question was thrashed out. Meanwhile, the courses have been suspended for three months.

Board Changes

Mr. R. H. C. Boys, joint general manager in Africa of the British South Africa Co., has resigned this post and from his other appointments in the group, owing to family commitments.

*

Mr. G. M. Fletcher has been appointed a director of Mason and Barry.

*

East Rand Consolidated announce that Major-General W. W. Richards retired from the board of directors of the company at the annual general meeting, and did not offer himself for re-election owing to ill health. It is not proposed to fill the vacancy created, at the present time.

*

The board of Ariston Gold Mines (1929) Ltd., announce that Mr. S. H. Robinson has been appointed alternate director to Mr. C. J. Burns.

*

Mr. William K. Whiteford, president of Gulf Oil Corporation, has been elected a director of International Nickel Co. of Canada. Mr. Whiteford has been a member of the advisory committee of International Nickel since last February.

*

Mr. J. N. Davies, chairman of Pahang Consolidated Co., has been appointed managing director.

**RHODESIAN SELECTION
TRUST GROUP OF
COMPANIES**

GEOLOGIST — GEOCHEMIST required for field mineral exploration in the Bechuanaland Protectorate. Limited field experience acceptable but important that applicant should be fully conversant with wet method geochemical analytical techniques. Commencing salary according to qualifications and experience. Six weeks' leave per annum with accumulation up to eighteen weeks. Field allowance, bonus, share purchase plan, pension and medical schemes. Applications in the first instance to the Personnel Officer, Rhodesian Selection Trust Limited, P.O. Box 1479, Salisbury, Southern Rhodesia.

CORNISH MINING: Wanted for study books, accounts, documents, worthless shares. Brooke, Kennet End, Harrow Park, Harrow on the Hill, Middlesex.

METALLURGIST required as assistant to the Reduction Superintendent at a British gold mine in Ghana. Starting salary of not less than £1,500 per annum is envisaged for a suitably qualified man. Tours abroad are for 15 months followed by 3 months paid leave. Passages and housing provided. The post is healthy and suitable for children. The appointment is permanent and pensionable. Apply with particulars of experience, qualifications and age to Box 671, c/o *The Mining Journal*, 15 Wilson Street, Moor-gate, London, E.C.2.

**RHODESIAN SELECTION
TRUST GROUP OF
COMPANIES**

GEOLOGIST with from three to seven years' experience required for field mineral exploration in the Federation. Commencing salary £1,500 to £2,000 per annum depending upon qualifications and experience. Six weeks' leave per annum with accumulation up to eighteen weeks. Field allowance, bonus, share purchase plan, pension and medical schemes. Applications in the first instance to the Personnel Officer, Rhodesian Selection Trust Limited, P.O. Box 1479, Salisbury, Southern Rhodesia.

PROSPECTORS

required by an alluvial mining company in

SIERRA LEONE

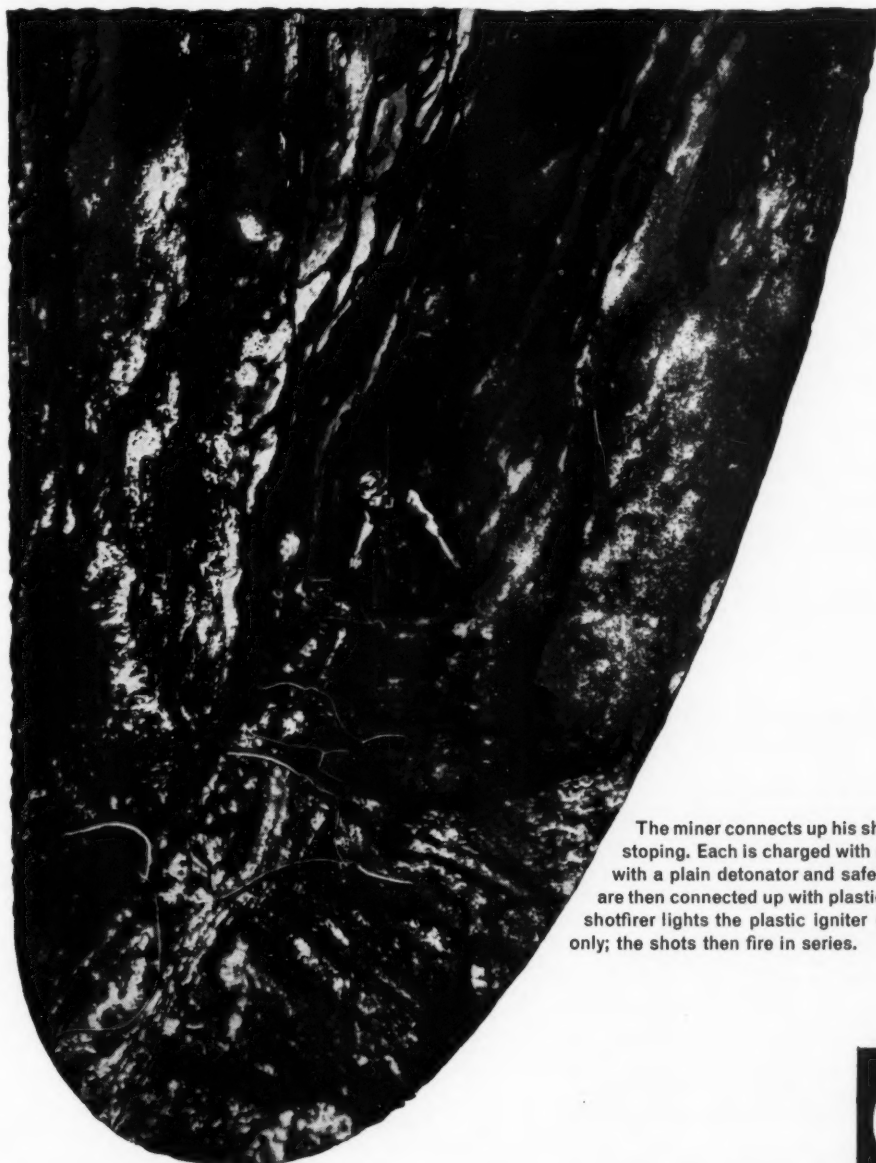
Applicants must hold a mining degree or diploma and should preferably have had previous bush experience. Basic starting salary £1,080 p.a. plus overseas allowance £360 p.a. and marriage allowance £180 p.a. There is also a bush allowance and a generous provident and bonus fund and a pension and life assurance scheme.

Free passages to and from Africa. Tours normally twelve months followed by twelve weeks leave. Married accommodation not available.

Write giving details of age, education, qualifications and experience to W.5, M.J. Mine Employment Department, Selection Trust Limited, Masons Avenue, London, E.C.2.

For all aspects of metal-mining— I.C.I. explosives, accessories—and know-how

I.C.I.'s Nobel Division supplies explosives in various strengths to suit different hardnesses of rock, together with plain detonators, safety fuse, plastic igniter cord and connectors. Not only that—I.C.I. also supplies know-how through the Technical Service staff of Nobel Division; explosives engineers with wide experience of all types of mining methods are available to give advice on problems associated with blasting in mines and, in many cases, to give personal supervision especially when new techniques are being introduced.



The miner connects up his shots for underhand stoping. Each is charged with explosives primed with a plain detonator and safety fuse. The fuses are then connected up with plastic igniter cord. The shotfirer lights the plastic igniter cord at one point only; the shots then fire in series.



BOOK REVIEWS

Woods Practical Guide to Fan Engineering by W. C. Osborne and C. G. Turner, published by Woods of Colchester, Ltd., pp. 290, with tables and illustrations. Price 17s. 6d.

It is now eight years since this book was first issued. During this period five re-prints were found to be necessary and in addition the Guide was published in French. Thus the popularity of "Woods Practical Guide to Fan Engineering" is amply illustrated and the second edition will undoubtedly prove equally successful. The book concisely presents the basic principles governing the selection and operation of fans and throughout the emphasis is on the practical side of this very important subject.

There are 22 sections embracing a very wide field. Although much of the subject matter is of limited direct interest to the mine ventilation engineer, e.g. the treatment of solar radiation, recommended air changes, etc., it is, however, information which is not readily available and in consequence merits inclusion in a practical guide of this type.

Many of the numerous worked examples which are included at appropriate stages will be particularly useful to students. A book of this nature does not, of course, aspire to supersede standard text books but rather does it complement them. It is essentially a convenient collection of practical data and no more theory is given than is necessary to an intelligent understanding of the text. Several useful tables are included.

The second edition has been considerably expanded by the inclusion of new chapters on drying and air heating. A particularly welcome addition is a comprehensive section dealing with noise in fan systems and sound level assessment. At the very modest price of 17/6d. "Woods Practical Guide to Fan Engineering" is a bargain. The book can be obtained directly from Woods of Colchester or through the usual book channels.

Properties of Elemental and Compound Semi-Conductors, pp. 340, Edited by Harry C. Gatos. Price \$8.50.

Flat Rolled Products 2: Semi-Finished and Finished, Edited by E. W. Earhart and R. D. Hindson. pp. 150. Price \$4.00.

These two books constitute vols. 5 and 6 respectively of the Metallurgical Society Conferences. They are published by Interscience Publishers Inc., 250 Fifth Avenue, New York 1, N.Y., and Interscience Publishers Ltd., London.

Vol. 5 contains the papers presented at the Conference on the properties of Elemental and Compound Semi-conductors held in Boston, August 31-September 2, 1959. The conference was organized, planned and sponsored by the Semi-conductors Committee of the Metallurgical Society of AIME. The material is grouped into five parts: I. Metallurgical and Chemical Aspects; II. Solid State and Surface Reactions; III. Chemical and Lattice Defects;

IV. Physical Properties and Device Applications; and V. The Role of Dislocations in Device Properties. Part V is a record of the panel discussions.

Collected together in Vol. 6 are the proceedings of the Second Annual Conference sponsored by the Mechanical Working Committee of the Iron and Steel Division, the Metallurgical Society of AIME. The subject matter has been closely related to the process metallurgy of flat rolled steel products.

The next Conference-Symposium of the Mechanical Working Committee will be held in Pittsburgh at the Penn-Sheraton Hotel, Jan. 18, 1961, and will be devoted to bar products.

Design of Modern Steel Structures, by Linton E. Grinter, Ph.D., C.E., pp. 491. Illustrated with photographs and diagrams. Published by the Macmillan Company, New York. New York and London. Price 45s.

This is the second edition of a work originally published in 1941. The author is Dean and Research Professor, Graduate School, the University of Florida. The book forms a companion to *Theory of Modern Steel Structures, Vol. 1*. Together these two books encompass all the problems that can be treated to advantage in the usual undergraduate courses in statically determinate structures.

The plan of organization remains unchanged from the first edition. Joints and connections are treated first in the following order: rivets, welds, bolts, pins and timber connections. Member design follows the study of connections.

Both provide an extension of the theoretical concepts introduced in *Strength of Materials* and relate such concepts to the field of design practice through specifications. Four important structures are presented in separate chapters as major design examples. A building girder is designed as a welded structure and also as a riveted structure. Similarly, a roof truss is designed both for welding and riveting. Then a low-truss highway bridge is designed for riveting. Finally, a preliminary design is presented for a multi-storey office building with welded joints.

The Annual Report of the Overseas Geological Surveys, 1958-59, by S. H. Shaw, H.M.S.O. pp. 42, price 2s. 6d.

This report covers the period September 1, 1958 to August 31, 1959, and reviews the activities of the Geological Surveys overseas and the Headquarters Organization in London. Dr. Frank Dixey, the first Director of Overseas (formerly Colonial) Geological Surveys, retired in June 1959 after completing 41 years of distinguished and unbroken service with the Colonial Administration, and was succeeded by Dr. Shaw, deputy director.

Accounts of the work done by 17 of the Geological Surveys with which the Directorate was concerned are summarized.

Many mineral discoveries were reported, including further deposits of

bauxite in British Guiana, a coal seam 12½ ft. thick near the Brunei-Sarawak border, and other occurrences of coal in Swaziland. Graphite was also disclosed over 40 miles of strike in the area of Petauke, in Northern Rhodesia, about 150 miles west of the Nyasaland border at Fort Jameson.

Recruitment during the year was disappointing and, of the 58 candidates who were interviewed, only seven finally accepted the offers of appointment. Geological posts in the overseas territories have unfortunately lost some of their former appeal, and, as emphasized in the Report for 1956-57, the attraction of higher salaries as compared with those of posts at home no longer applies. Moreover, there is often a misinformed but nevertheless real fear of the political futures of many of the countries concerned, which is probably also one of the reasons for a slightly increased desire for contract posts, although the terms of this type of agreement are not generally nearly so favourable as those offered, for example, by Ghana, where 40 posts on the Geological Survey have recently been advertised.

Black Avalanche, by Arthur and Mary Sellwood, pp. 176. Published by Frederic Muller Ltd., London, Price 16s. net.

This is an informative and very readable account, written essentially from the standpoints of the people concerned, of the disaster at Knockshinnoch Castle Colliery in September, 1950, when a field of peat, collapsing beneath torrential rain, cracked the coal face of No. 5 Heading and hurled a sea of liquid mud towards the bottom of the pit. One hundred and sixteen lives were saved in the greatest and most complex mine-rescue operation of all time. The authors talked with the men and women who endured the dangers and responsibilities of this mining epic, but for whose courage, discipline and ingenuity the death roll would have been heavy indeed. The book describes, stage by stage, the intensely exciting progress of the rescuers and the reactions of the trapped.

Mineral Facts and Problems, 1960 Edition, Bulletin 585, U.S. Bureau of Mines publication, obtainable only from the Superintendent of Documents, Government Printing Office, Washington 25, D.C. \$6. per copy.

A new edition of *Mineral Facts and Problems*, reference book on metals, nonmetals and mineral fuels and the industries that produce them, has just been published by the Bureau of Mines, the Department of the Interior, United States.

Covering the history, technology and uses of minerals, the new thousand-page volume, describes many recent advances in mineral development. Eighty-seven individual chapters, each written by a Bureau of Mines authority, as well as a comprehensive index make this a very valuable reference work.



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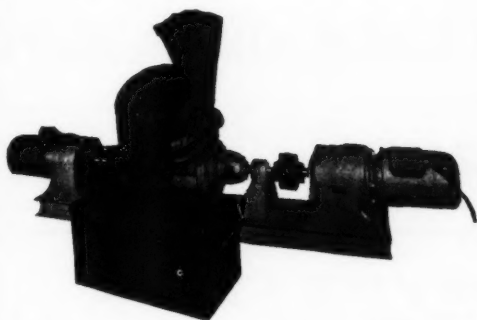
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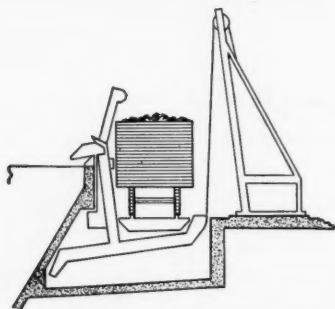
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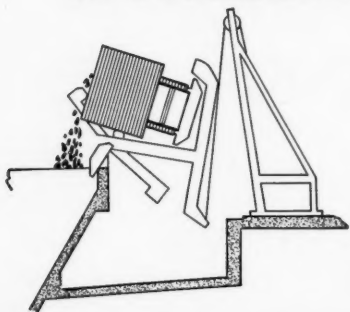
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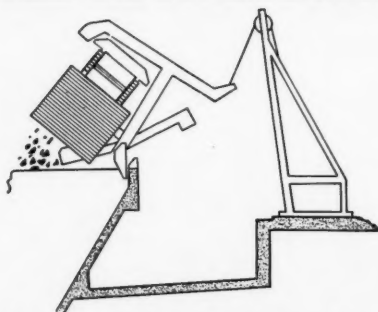
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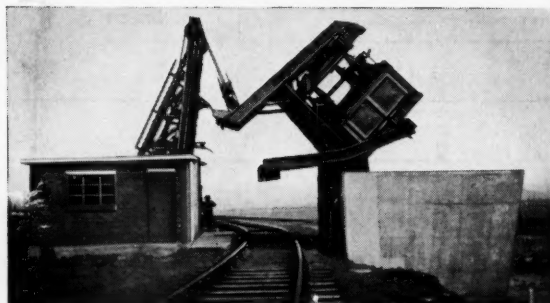
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